The TOOL ENGINEER

In This Issue

A Detroit motor car manufacturer gets an additional 50% of service out of his conventional flat special alloy milling cutter blades by using this cutter head and special locking device. See page 24.

THE GAIRING TOOL COMPANY, DETROIT, MICH.
Patent applied for.

OCTOBER 1938

Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

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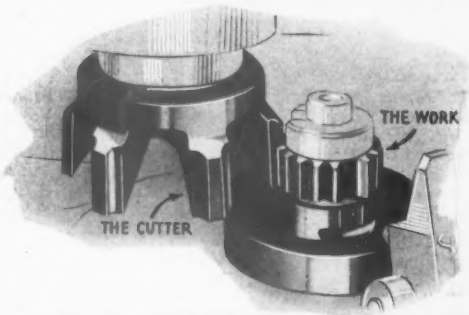
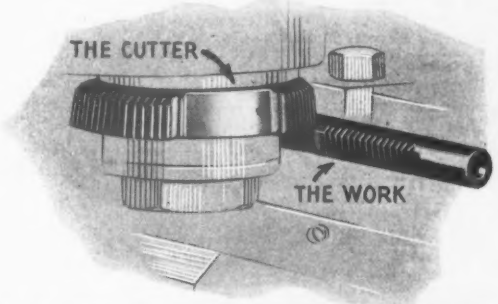
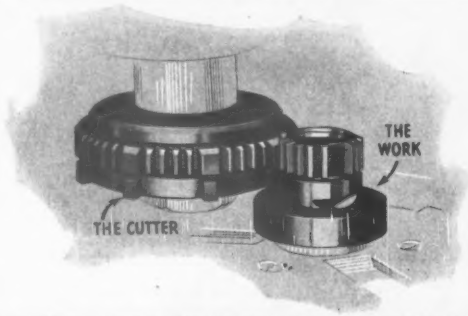
Our 64-page booklet, "The Practical Art of Generating," will give you a more intimate picture of the versatile application of the Gear Shaper Method. Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Building, Detroit, Michigan.



Cutting these involute slots below the level of the outer rim on this gear blank simplified one automotive problem. Note the special-purpose multi-prong Fellows Cutter used.



In this case Gear Shaper Versatility is exemplified in the cutting of an involute rack for a Diesel Engine valve-operating mechanism.



A "Natural" for the Gear Shaper is the cutting of the clutch teeth and syncro-mesh ring slots in this automobile transmission gear at one setting of the work.

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Vol. VII OCTOBER, 1938 No. 6

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Owing to the nature of the American Society of Tool Engineers, a technical organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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Unretouched photo of an etched cutaway section of a FIBRO FORGED Cap Screw.

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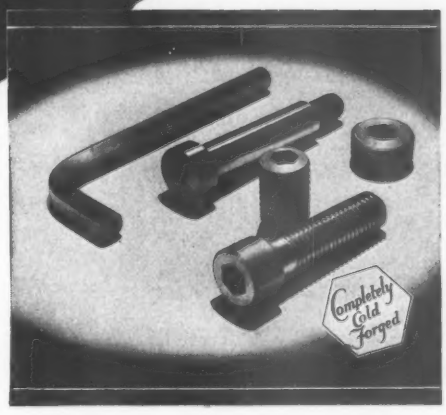

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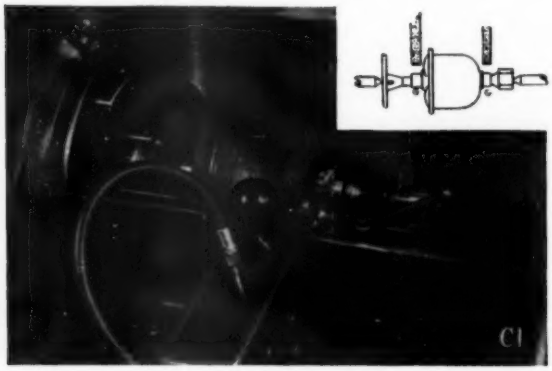
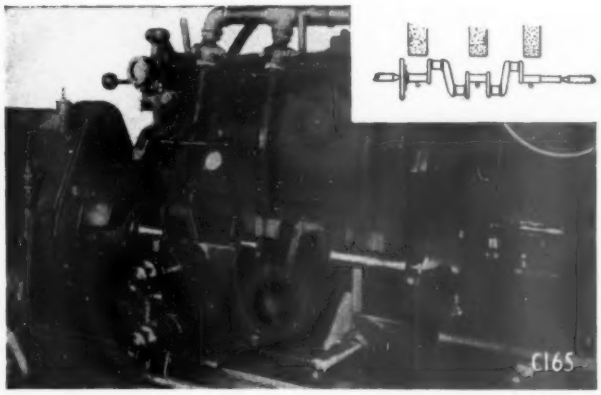
The quicker the work is out of the machine the less the cost of the grinding operation. This is the way you profit from Landis Grinders with multiple wheel mountings. The user of the machine here pictured is grinding differential case journals on a Landis 10" x 18" Type D Hydraulic equipped with two grinding wheels and Landis-Solex sizing.

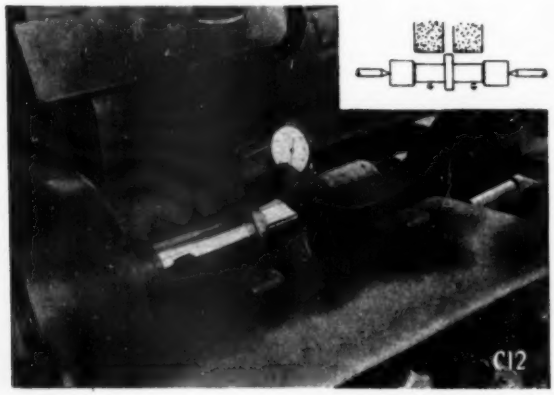
If you're wise you will look into this matter of multiple wheel grinding. True enough, only a limited amount of work lends itself to this method. But when it does, grinding costs certainly can be made to drop. Check the three typical operations pictured to acquaint yourself with some of the possibilities. No. 267



Grinding a track roller shaft on a Landis 10" x 36" Type D Plain Hydraulic equipped with two grinding wheels. There are many parts of this general nature which may be so handled. The diameters may be the same or may be radically different. Also they may be straight, tapered or otherwise formed.



Imagine how this crankshaft must feel when it sees three large grinding wheels coming toward it simultaneously. One thing is certain. When work and wheels meet, things will happen rapidly and the work will be out of the machine in a jiffy. Here a Landis 16" Plain Hydraulic is grinding three crankshaft main bearings simultaneously.



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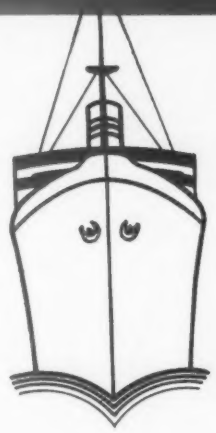

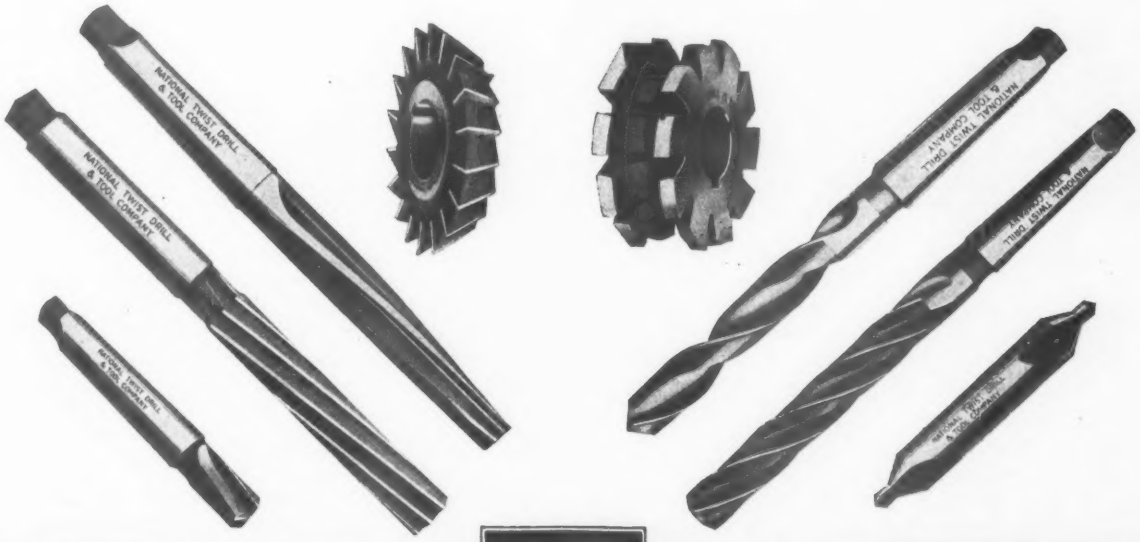

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The Why of *Conventions*

AN EDITORIAL

BY

A. E. RYLANDER

AS FAR BACK as history records and presumably before that, primitive as well as civilized peoples have convened to exchange ideas, to create states, to formulate religious and political credos, to foster education and science, to promote human welfare and progress. And sometimes, it must be admitted, to destroy established orders. But on the whole, conventions are constructive, have in view the betterment of society. In this age especially, such convention is necessary to preserve order, to agree on codes of practice that adequate foundations be established for future expansion. It is entirely in order, then, that the American Society of Tool Engineers holds annual and semi-annual congress to promote the science of Tool Engineering. For our meetings are congresses, as essential to the progress of our profession as a senate to the furtherance of affairs of state.

At such meetings, matters of vital import—not only to the Society but to each individual member—are discussed and resolved; something is definitely projected for the coming six months or year. And because such matters have received grave consideration since the Society was founded, the A.S.T.E. has grown and prospered. It is not implied here that measures affected have always been right, but they seemed right at the time proposed, were discarded at later meetings if found wanting. Other proposals, again, have proven of inestimable value, have been retained as essential parts in the structure of the order.

At conventions, one has the privilege of listening to the keenest minds in one's field; papers are read by technical, industrial and economic leaders, there are thesis and rebuttal, the projected viewpoints of various branches of art, the whole is educational and constructive. Then, as conventions are held in various centers, there is the educational value of travel, of plant tours, when one sees the processing of goods that previously one has only read about. The congress over, one returns home with fresh ideas, the richer mentally and spiritually and the more valuable to the employer because of broader knowledge of one's vocation.

It is significant that various important cities now vie for the conventions of the Tool Engineers, not so much because our meetings are largely attended, as numbers go, but because engineering represents leadership in the industrial scheme of the nation. The engineer is not a casual observer; rather, he is trained to notice details and, committed to progress, is ready to exchange ideas. And, to an industry visited, a chance, friendly suggestion by an intelligent observer often turns one of those things into a highly profitable line. But, fair trade, the observer also carries something away with him not for immediate use perhaps, but for future reference.

This month, Tool Engineers convene in Pittsburgh, a city that offers many inducements, many diversions, that manufactures essentials to most of the industries represented. "You build automobiles . . . streamliners . . . refrigerators . . . machine tools. Well, we make electric motors and appliances, air brakes, presses adequate for the forming of large parts. Come and see us, learn more about the machinery and equipment used in your respective lines. Visit the shrines of our poets, whose songs have become classics, come and make friends with us." And, it may be added, come and make new friends among your fellow Tool Engineers, imbibe the spirit of progress that spurs the A.S.T.E. to leadership in the engineering field. Yes, conventions are essential to human progress, that is why we have them. But come, and see for yourself; there is nothing like first-hand observation. The meeting place is Pittsburgh, the date—October 14th and 15th.

Last Call For Pittsburgh

YES SIR! Mr. Tool Engineer, this is "the last call for Pittsburgh." Within three of four days upon your receipt of this publication in the mail, you will be leaving for Pittsburgh—if you are going to join us, and we hope you will be with us—for the big program starts at 9:00 A.M., October 14, with registration at the William Penn Hotel (convention headquarters.)

Tool Engineering has become the most important profession in industry. Tool Engineers owe it to themselves to invest some of their earnings into the advancement of their profession. Opportunities which are presented to the Tool Engineer for improving his knowledge and ability should not be overlooked. This Pittsburgh trip carries the utmost of educational value which can be crammed into the two day session. Industrial organizations in many instances can well afford to finance their Tool Engineers to this meeting and gain splendid returns from the increased efficiency and knowledge of manufacturing technique. The cost has been held down so as to make it a good investment for the individual Tool Engineer.

Better make up your mind now to be with us, you will enjoy the many special features of the program as well as the excellent plant tours which have been arranged for your pleasure and instruction. These plant tours leave William Penn Hotel by bus or special train at 9:30 A.M. October 14. You must make your selection in advance. Among the plants to be visited are the Aluminum Company of America, the Heppenstall Company, Firth-Sterling Steel Company, Mesta Machine Company, Mellon Institute, U. S. Steel Company and Westinghouse Electric and Manufacturing Company.

Top—one of the finest aerial photographs ever made of the downtown area of Pittsburgh. This illustration shows the junction of the Monongahela and Allegheny rivers meeting at the Ohio river and at the triangle apex of the downtown area, the famed "Golden Triangle."

Below—"Cathedral of Learning" main building of the University of Pittsburgh—only skyscraper schoolhouse in the world.

At 4:30 P.M. on this first day of your Pittsburgh sojourn you will return from the plant tours. At 6:30 the Semi-Annual dinner at the William Penn Hotel, Chatter Box room. The principal speaker on this exceptionally fine occasion is J. H. Van Devanter, Editor, The Iron Age, who will speak to you on the subject, "Tools, Taxes and Wages." At 8:00 P.M. the Semi-Annual Meeting will be in session with the technical session.

At 10:00 A.M. on October 15, the second day you are invited to participate in the technical session at the Urban Room of the William Penn Hotel when Mr. L. W. Chubb, Westinghouse Elec. & Mfg. Co. executive, will speak to you on the subject "Industrial Advancement Through Scientific Research." At this same time the Board of Directors' Meeting of the American Society of Tool Engineers will be held in Parlor E of the William Penn Hotel. At 2:00 P.M. on Saturday, October 15, an

(Continued on page 28)

'Profilometer' Measures Surface Finish in the Shop

By
ROY T. BRAMSON
EDITOR, THE TOOL ENGINEER

SINCE this publication carried an article on the "Profilograph" in August, 1934, tremendous progress has been made in the measurement of surface finish. Dr. Ernest J. Abbott of the Physicists Research Company of Ann Arbor, Michigan, has developed an instrument known as the "Profilometer." This precision instrument is a practical "tool," suitable for use in mass production plants—or in the machine shop. It is a portable device which may be carried from one part of the shop or plant to another, is sturdily built, gives a dial reading providing a standard of measurement in surface finish and, therefore, gives an accurate comparison of the surface finish on various work pieces.

Measuring Surface "Roughness"

In reality, the Profilometer is an instrument which measures surface roughness. Any surface consists of finely spaced irregularities, "scratches," which usually are apparent to the eye and which determine the quality of the surface finish. These irregularities often are but a few thousands of an inch in width and considerably less in depth. Hundreds of these scratches or irregularities are covered by the "tracer" point of the Profilometer while traversing as little as one lineal inch of surface. Surface measurement, therefore, consists of determining or measuring the magnitude of these irregularities.

Figure 1. Above: The portable Profilometer for use in the mass production plant and machine shop showing the operator in an automobile plant measuring the surface of a piston.

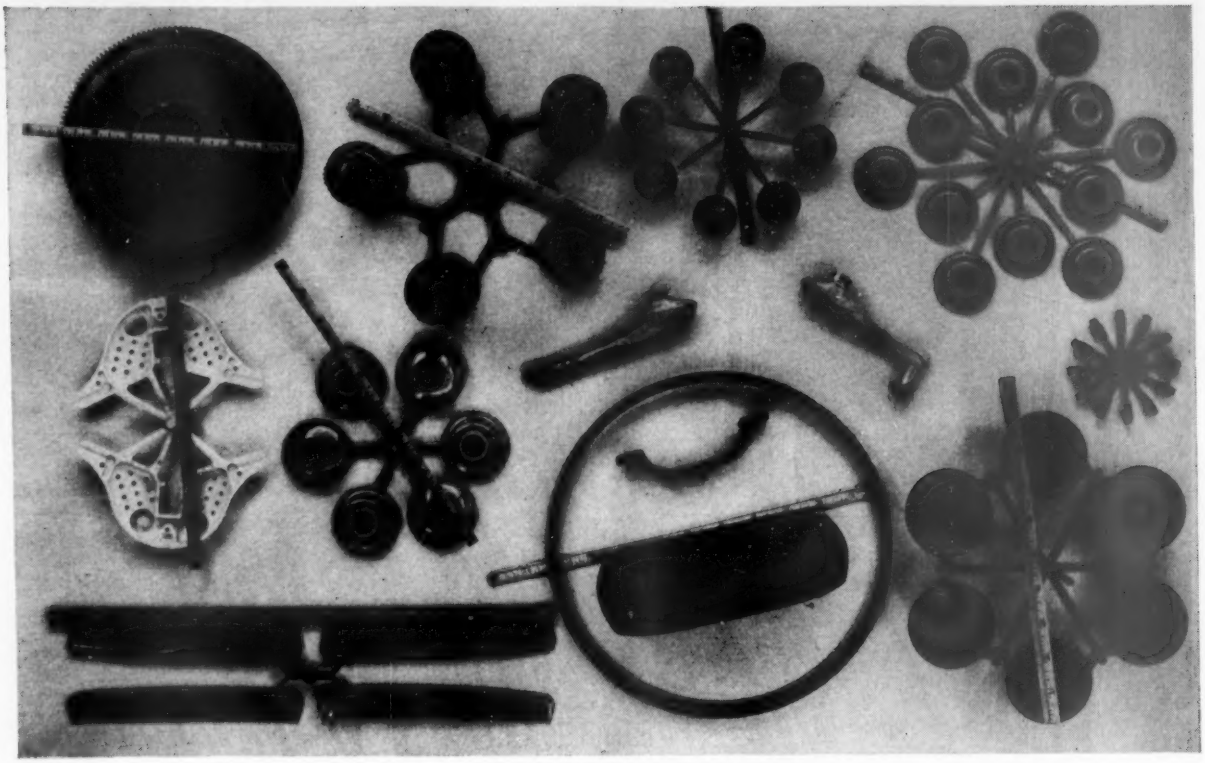
The Profilometer presents to the Tool Engineer a practical "roughness meter" which gives him a basis of comparison for surface finishes and thereby a known means by which specifications can be written and the quality of various surfaces designated. Two essential characteristics make this instrument a practical tool for the production executive. (1) The contact with the surface is fine enough to trace the bottom of the principle irregularities without damage to the specimen. (2) The indication on the dial or meter does not show the individual irregularities because in tracing the surface a reasonable speed could not possibly indicate to the eye the actual measurement of the individual irregularities. Instead, the instrument automatically determines the average height of the irregularities, and indicates this average value in terms of "microinches."

Operating the Profilometer, therefore, becomes a comparatively simple task little more difficult than taking a dial indicator reading.

Easy to Operate

The type P Profilometer is especially designed for shop use. No external connections are required and the instrument can be carried to any job. Measurements are made while the work piece is in place on the producing machine, and frequently while the machine is in operation. The tracer unit is about the size of a package of cigarettes, and is moved across the surface whose roughness is to be determined, and the meter or dial reading taken. For convenience, the dial or meter is calibrated in terms of microinches. A microinch is .000001". The tracer is moved by hand or mechanically as desired. It is not necessary to press the tracer with much pressure against the surface as the weight of the tracer unit itself is sufficient for accurate reading. The readings obtained are also independent of the speed at which the tracer unit is moved. It has been found, however, that a

(Continued on page 34)



Injection Molding

By

JACK GEERS

INDEX MACHINERY CORPORATION

THE past three years have witnessed a very great advancement in the production of thermo-plastic articles by means of Injection Molding. In discussing this topic it is imperative that we first understand clearly what constitutes a thermo-plastic material.

A thermo-plastic material is one that will become plastic when heated and will not solidify until it is cooled. The injection of such a material, therefore, produces only a physical change in the material. The molded object can be remelted and molded over again if desired. This characteristic enables the molder to use up all of his scrap material such as gates and sprues by simply grinding them up and putting the material back into the machine.

The development of a large selection of thermo-plastic materials has made it possible for the molder to secure materials suitable for his particular job and has placed within the scope of injection molding many articles which a few years ago it was thought impossible to produce by means of injection molding.

Injection molding machinery has developed tremendously in the past three years and today fully-automatic machines are available to the mold industry which machines are capable of injecting castings much larger than had ever been dreamed of just a few years ago.

The fundamental principles involved in the operation of the injection molding machine are simple in themselves and constitute:

1—A heating cylinder in which the material to be injected is melted to the required degree of plasticity.

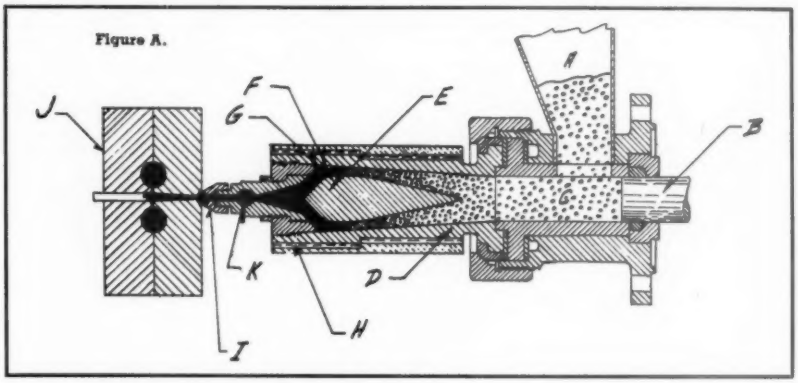
2—A mechanical or hydraulic means of forcing the plasticized material into the mold.

Figure "A" is a sketch of a typical heating cylinder for an injection molding machine. The thermo-plastic material is loaded into the hopper "A" in a granular form. It is automatically fed from the hopper into the sleeve "C". As the piston "B" advances the charge of granular material fed into the sleeve "C" is forced into the heating cylinder "D."

It will be noted that as the material enters the heating cylinder its cross-sectional area is very great. To heat the material with this cross-sectional area would not be possible due to the poor conduction of heat by the material itself. If a high heat is applied to this heavy cross-section the material on the outside will decompose long before sufficient heat is conducted through it to plasticize the material in the center of the mass.

In order to overcome this difficulty a torpedo-shaped spreader "E" is mounted

Figure A.



inside of the heating cylinder. As the material progresses through the heating cylinder the spreader causes the cross-section of the material to be reduced.

The spreader is in contact with the inside walls of the heating cylinder at the point "F." When the heating elements "H" are turned on, the outside shell of the heating cylinder is heated. The heat is conducted through the shell and into the spreader "E." Since the spreader and the cylinder are both hot, the material passing between the spreader and the inside walls of the heating cylinder is heated from both sides and can be readily plasticized without danger of burning.

By the time the material reaches the point "G" it is completely plasticized and converges to pass through the nozzle "I" and into the mold "J." A cock "K" is placed in the nozzle and is mechanically opened and closed when using materials that become exceptionally plastic and pour or ooze out of the nozzle between operations of the machine.

The heating cylinder is maintained at a definite temperature by means of automatic temperature controls which turn off the heating elements when the desired temperature is reached and turn them on again just as soon as the temperature drops below the required heat.

The time cycle for the operation of the machine is automatically controlled by electric time clocks. These clocks regulate the interval during which the pressure is held on the material for injection; the molds are held closed for setting the material; and the molds remain open for removal of the finished castings, loading of inserts, etc. It is imperative that the machines be operated automatically whenever possible to insure uniform production of castings.

Let us assume that a mold is installed in the machine for production of parts which require the temperature of the heating cylinder to be 385° Fahrenheit. When the cylinder is carried at this temperature the casting is completed in a total time of twenty seconds. If the machine is operated automatically the interval from the time the material enters the sleeve "C" until the time it leaves the nozzle "I" will remain constant for any charge fed into the cylinder. Consequently the material leaving the nozzle will always be at the same temperature.

It must be remembered that the period of time the material remains in the heating cylinder as well as the temperature of the cylinder itself governs the amount of heat that will be absorbed by the material.

Referring to the above example let us assume that the machine is operated manually instead of automatically. In one case the operator closes the mold instantly after the casting dropped out and he secures a good casting. In another case he is busy putting material into the hopper when the mold opens and he loses time in closing the mold again. The resulting casting has an excessive flash because the material has burned due to too long a contact with the heating cylinder.

In succeeding operations the operator speeds up his cycle to overcome flash and in a short while is failing to fill out the cavities because the material has not been in the cylinder long enough to sufficiently plasticize it.

This juggling of the cycle causes unnecessary worry and fatigue to the operator and increases greatly the number of rejects in the day's run. In order to assure uniform production it is therefore essential to always operate injection molding machines on an accurately timed cycle. In cases where inserts are used and it is impossible to operate completely automatic, then it is advisable to time the open part of the cycle so that the complete cycle is uniform even though it is not automatic.

First cut shows the development in the type of articles which have been successfully molded by means of injection the past three years. Lack of space makes it necessary for us to show these items in a greatly reduced picture but reference to the scales shown on the objects indicates clearly the size of the products portrayed.

The increasing demand for larger and larger castings has brought forward not only the problem of heating material but also the problem of holding the molds closed against the terrific force of injection created when large area

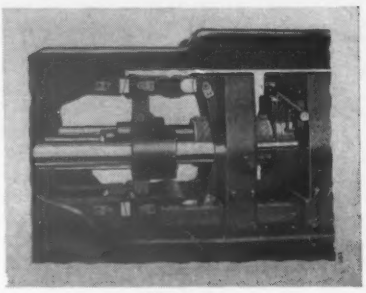


Figure C.

castings are made. Rigid mechanism for holding the molds closed had to be developed and at the same time the machines had to be built so as to make the set-up of the machines simple. The work necessary to change molds had to be kept at a minimum, in order that the cost of injection molding could be kept low.

Figure "C" shows the rigid mold locking mechanism in use on the Index Machinery Corporation's latest Lester-designed Fully-Automatic Injection Molding machine. This Toggle-mechanism is designed to take the terrific load of injection off the toggle pins and transmit it directly to the heavy box type of frame by means of the heavy toggle links.

Figure "D" is a picture of the machine itself.

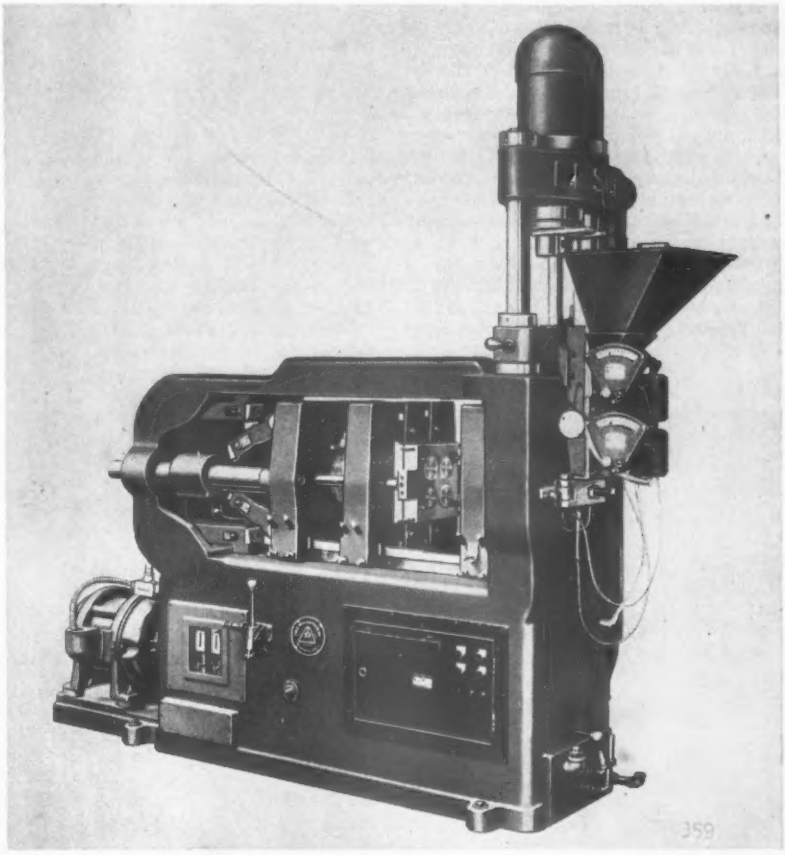


Figure D.

Torch Hardening Method for GEARS

By
W. E. SYKES
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Buffalo, New York

IT IS well known that metallic gear teeth will carry a heavier load when they are hardened. The technique of hardening relatively small gears, that is to say gears below 12" diameter, has been well developed and is practiced considerably. The hardening of larger gears has presented some difficulty although such gears have been made for a considerable period. Some are furnace heated and afterwards quenched; others are carburized and quenched. While these methods are useful, the application of such gears is limited to somewhat low speeds due to the fact that it is impracticable to limit the distortion to a very small amount.

For several decades there has been a desire to harden the teeth of large gears without appreciable distortion. When the nitriding process was introduced about twenty years ago it was thought that it would be especially useful for large size gear wheels; but it has not proved as universally applicable as was expected. The nitriding process is somewhat slow and expensive (when applied to large gears) and the depth of hardness is not quite as much as is desired. Moreover, the surface hardness resulting from the nitriding process is so hard that it tends to make the metal too brittle. Nevertheless it has proved satisfactory for many relatively large gear wheels but its expense has prevented its wide adoption.

The idea of hardening gear teeth by means of an oxy-acetylene flame followed by a quick quench is not new. It was practiced twenty years ago but made little headway until the introduction—some seven or eight years ago—of a machine adapted to guide mechanically a suitable torch fitted with a water jet. This gave more uniform results and was more economical. Mr. A. E. Shorter has pioneered this development in England and as a result the method has created much interest in the U.S.A.

This process has the appearance of being remarkably simple, which is perhaps its greatest disadvantage. It has often been assumed that it is a simple matter to devise a mechanical method to guide a torch with a water jet attached. But the haphazard way in which the operation has been carried out has often caused disappointing results and in consequence torch hardening has been deprecated in certain quarters.

It is well known that when a carburizing process is used, or any other hardening process including the nitriding process, suitable steels must be adopted. When the case-hardening of gears was first introduced considerable trouble was experienced due to the fact that many makers did not realize how important it was to obtain what was called at the time a pure steel. In view of this knowledge and experience it is strange that many experienced engineers should expect the torch hardening process to operate successfully on almost any kind of material. It should hardly be necessary to explain that the application of a torch to poor steel will not eliminate its impurities and other defects. Poor material torch hardened or hardened in any other way may give worse results in service than if it were unhardened. It is easy with the torch hardening method to ruin an otherwise good gear; and it is also easy to make a poor gear into a hopelessly bad one.

Many Advantages

It is the author's opinion that the torch hardening method possesses so many advantages that it is likely to be used on an extensive scale notwithstanding a few failures and a certain amount of disparagement. It has the extremely important advantages of hardening gear teeth without appreciable distortion and of doing this relatively economically. Its development has been under way for the last twenty years but it has been intensely used only during the past five or six years, and it is reasonable to expect there is still much to be learned about it. The knowledge of its limitations is as important as the knowledge of its disadvantages.

When considering this process it is desirable to bear in mind that by its use steel is heated to a somewhat high temperature and rapidly quenched and that a steel suitable for this treatment should be used. Up to the present non-alloyed steel containing from .4 to .6% carbon seems to be suitable. Some of the alloy steels have given good results but greater care is necessary to apply the correct heat and to apply the quenching fluid at the correct distance from the heating flame. Some steel castings containing as low as 3% carbon with a high manganese percentage will also harden satisfactorily.

One of the difficulties in using the process is to gauge or measure the temperature of the heated metal. So far as the author knows no really satisfactory pyrometer or other temperature measuring instrument is available which is applicable to the torch hardening method. And it seems equally difficult to ascertain the correct temperature or to measure the temperature at the place where the quenching fluid strikes the work. There is also another difficulty: It seems impossible to correctly ascertain the hardness of the gear tooth except by removing it from a gear; which, of course, is impracticable excepting for experimental purposes. None of the available hardness testing instruments seem adapted to operate on the gear tooth surface when it lies between two teeth. All development work, however, presents some difficulties and progress consists mainly in overcoming them.

FIGURE 1

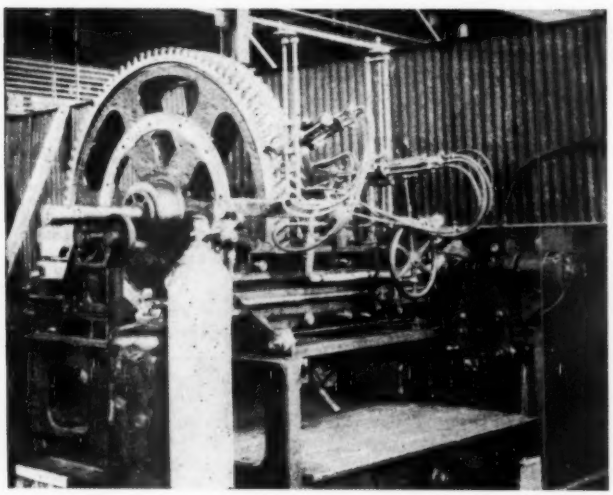
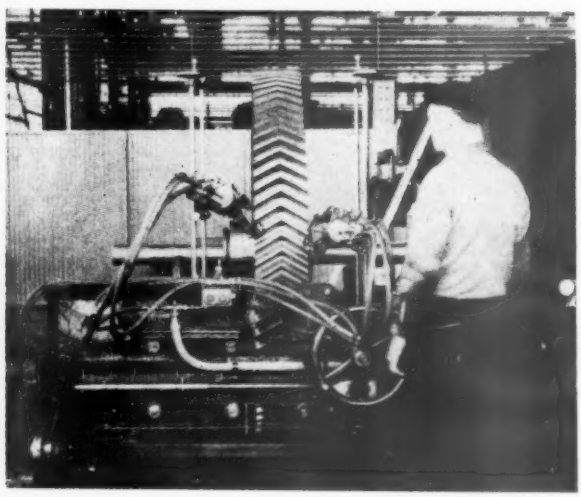


FIGURE 2



If we cannot measure the hardness or the temperature but can get good results without doing so there is no reason to discard the process pending the development of suitable instruments. In nearly all developments the method and machine came first and the instruments of measurement and verification came later. The method, in the author's opinion, has been satisfactorily proved to be useful and the machines available have proved suitable.

The machine developed by the Farrel-Birmingham Company, Inc., is shown here. It is especially developed to harden gears which connect parallel axes. No attempt has been made to apply it to the hardening of worm gears or bevel gears. The Gleason Works, however, has developed a machine for the hardening of bevel gears.

Fig. 1 shows the means for supporting the work. It can be seen that the gear wheel to be hardened is mounted on an arbor or in some cases on its own shaft, and the arbor or shaft is supported in pintle bearings, which are a very convenient device for the purpose.

Fig. 2 shows the torch or heating equipment. There are two torch heads, each of which carries two jets for the mixture of oxygen and acetylene. Each jet impinges one side of the gear tooth with the result that when herringbone gears are being hardened four jets are in simultaneous operation and therefore the right-hand helix of one tooth and the left-hand helix of another tooth are hardened simultaneously.

When single helical gears are hardened, as shown in Fig. 3, one pair of jets only may be used, or alternatively two pairs may be used, one pair working on one wheel and the other on a second wheel, the two wheels being ganged on one arbor. A similar method may be used for hardening straight teeth, where splines at the end of a shaft are being hardened.

The torch heads are provided with mechanisms for making suitable adjustments for correctly positioning the flame jets and the water jets, as may be seen in the photographs and in the drawings, Figs. 4 and 5. These adjustments are very important. It is necessary that the adjustment device be capable of imparting very fine and precise movement to each of the several jets. Each torch head equipment is carried, as can be seen in Fig. 5, on separate saddles which are adapted to traverse on a cross rail which is suitably and adjustably mounted on the main bed of the machine. The mechanism for traversing the saddles consists of a screw with a split nut operated in the same way as the lead screw and nut on a lathe. The screw is driven by a motor through a transi-torque variable speed gear and a worm gear; therefore a wide range of traverse speeds can be obtained readily.

The water supply is carried in the tank which forms part of the base of the machine, and it is carried to the water nozzles behind the flame nozzles by a motor-driven pump which is shown in Figs. 4 and 5. In addition the temperature of the water is controlled by keeping a constant supply running into the tank from the water mains while a constant amount is drained from the other end of the tank. The water temperature is, of course, easily measured by a thermometer and can be kept nearly constant. A constant water pressure is necessary; direct connection of the water nozzles to city water mains proved troublesome due to variable water pressure.

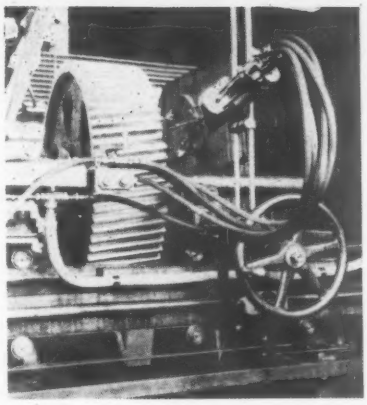


FIGURE 3

When helical or herringbone gears are being hardened it is necessary to rotate the wheel in unison with the traverse of the torches. This is accomplished easily by means of a pin guide which can be seen in Fig. 3. It is fixed to the traverse saddle of the machine and engages the teeth of the gear. It can also be seen clearly in Fig. 4. It is a very simple device for causing the torches to trace the correct helix and it obviates the necessity of the complicated and unsatisfactory mechanism used on prior machines.

The various control valves for the gases and for the water jets are interesting. It is necessary, if uniform results are to be obtained, that each of the jets has the same heating capacity; and for quick and ready manipulation it is desirable that all the jets be controlled by one valve. The fine-adjustment valves which give the correct proportion of oxygen and acetylene are separate, however. They are placed between the main control valve and the torches. Therefore after they are properly adjusted, the main control valve can be used to shut off the flame, and also to turn it on and ignite it.

The tracer pin referred to above is also used as the index device. When the saddle is moved so that the pin is out of engagement with the work the operator moves the wheel by hand so that the next tooth space is opposite the pin. He then moves the handwheel shown until the pin engages the gear again. This is a very quick operation and for repetition work could be made automatic; but when a large variety of work has to be dealt with an automatic mechanism is impractical.

Considerable experimental work has been done to obtain the most efficient flame tips in order to conserve the gases. Many torches have been tried which have proved extremely wasteful. Those now in use are remarkably economical.

To describe further the operation of the machine is rather difficult and if done would be somewhat tedious to read; therefore a colored movie camera film has been provided which shows the operation in a realistic manner, and it can be easily and entertainingly understood.

Up to the present this machine has been found suitable for hardening from 4 DP to 1 DP. It has been used for pitches as fine as 6 DP but, naturally, for the fine pitches it is not as satisfactory as for relatively coarse pitches. It is believed that it is practicable to harden as fine as 8 DP; but when the pitches are small the depth of hardness needs to be very precisely controlled and, moreover, the work is generally tedious and relatively slow; for it can be seen readily that to harden 100 teeth, 6 DP, takes nearly as long as to harden 100 teeth, 1 DP, and in consequence there is less to show for the labor and expense involved when fine pitch teeth are being hardened. However, fine pitch gears are usually of small diameter and can be more satisfactorily hardened by other methods.

Much experimental work has been necessary to obtain satisfactory results, more especially for the reason that there is no reliable means available for gauging or measuring the temperature, the hardness and the depth of heat penetration, or hardening effect. It has been necessary to ascertain the correct gas pressures and flames for different pitches and different materials; and this in turn has necessitated the determination of the most suitable size tips or jets to use. Much of this data has already been obtained and tabulated with the result that an operator can work to a chart and obtain uniform and satisfactory results without knowing the exact temperatures which are used.

To obtain data test teeth have been provided which we may call "false teeth." They are made in the form of narrow strips having the contour of a gear tooth, and are attached to the periphery of a cylinder. After they are hardened at different speeds and various trial settings of the equipment, they are taken off the cylinder, checked for hardness by means of standard hardness testing instruments, and are broken in order to ascertain the depth of the hardness. They are also polished on the surface of the fracture and the hardness is measured at the surface of the gear tooth and at various depths therefrom. In addition these pieces serve to show whether or not there is any appreciable deformation. To obtain this essential data is laborious and costly but it can be regarded as forming part of the equipment and therefore a capital expenditure.

One question often asked is what is the hardness obtained. We have found that we can obtain any hardness between 60 and 80 scleroscope or 400 to 550 Brinell. It is, however, as import-

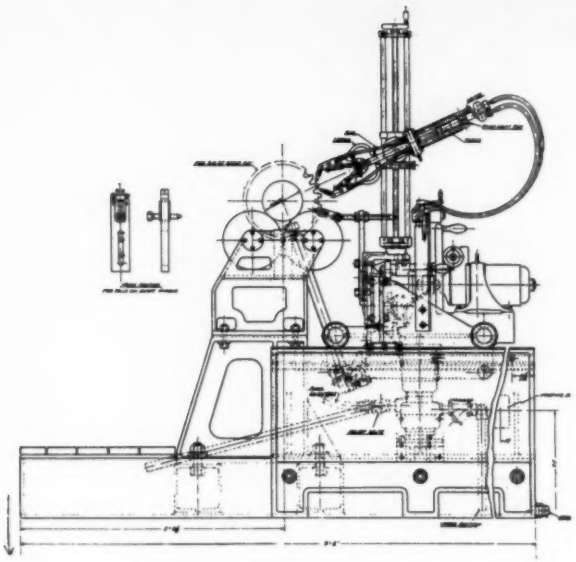


FIGURE 4

ant to know what is the desirable hardness for a torch hardened gear. According to experience up to date it does not seem desirable or beneficial to obtain a hardness greater than 75 scleroscope; indeed, it may be that a hardness around 70 scleroscope is better. It is not known for certain whether a very hard surface on any gear tooth is desirable. It is possible, as Professor Buckingham has pointed out, that a spring temper is better. The depth of the hardness is, of course, important; but it is more important that the hardness fade away gradually from the surface of the tooth towards the core or center of the tooth. A very sharp line of demarcation between the hardened portion and the soft portion seems disadvantageous, and such a result has to be guarded against. It is easy to get this undesirable result by making the metal too hot and too quickly quenching it. A vast variety of experiments has been made; for example, torches have been used in which the heating flame was completely surrounded by water. This results in a great waste of gas and generally a surface which is too hard and which shows a line of demarcation which is too sharp. It has the interesting result of leaving a bright surface even if the gear before hardening is rusty.

It is not the intention to give in this paper any information as to the rates of traverse for the various pitches and materials, nor information as to the torches or jets. This information, as already pointed out, is part of the equipment expenditure and it is not deemed prudent to publish it for the present.

Many questions have arisen as to the desirability of preheating and of drawing. The author has not found that either of these operations is necessary or desirable. Preheating, if desired, can easily be done without any appreciable extra expense, and a drawing operation can be carried out on the machine without great trouble; but it is believed that this last operation, at least, would be detrimental.

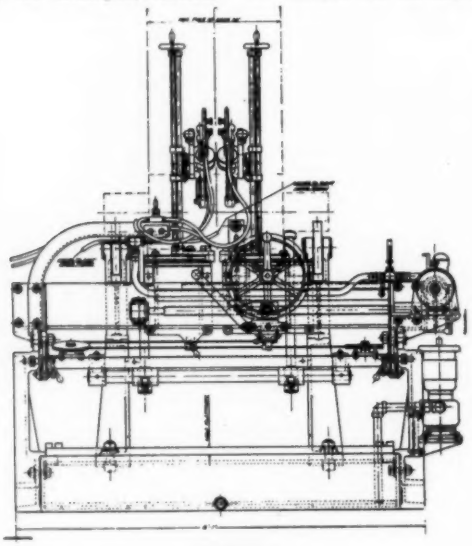


FIGURE 5

It is advisable to explain that almost similar results can be obtained with a variety of operating conditions; for example, approximately the same result can be obtained with a 4" speed of traverse of a torch as with a 6" speed provided the jets, or tips, are suitably altered as well as the position of the water sprays. And it is also advisable to explain that although a good set of operating instructions have been compiled they are probably not final. It is natural to expect that improvements will be made as experience is gained.

Some remarks regarding the results obtained with torch hardened gears in operation may properly be made. Up to the present there are approximately 700 pairs of gears which have been hardened on the machine described. These have given excellent results with the exception of one pair which showed some spalling near the ends of the teeth. However, it was found that the gears were not mounted in true alignment and it was not possible to determine whether the undesirable effect was due to the torch hardening or to the mounting of the gears. There are many sets in operation which have replaced similar gears unhardened, and the torch hardened ones have shown greatly increased life up to the present and are still running satisfactorily without discernible wear. It has been difficult to prevent too rapid adoption of torch hardened gears. Many customers have formed a habit of specifying torch hardened gears, and have occasionally specified them when they were either unnecessary or undesirable—the last mainly for the reason that sufficient knowledge as to the performance of similar gears was not available and the application without such knowledge would be too risky for a service of vital importance.

As one would expect, those who are most enthusiastic initially are those who most earnestly deprecate the process when there is any sign of trouble or when magical results in increased load carrying capacity are not obtained. It has been stated in a publication that torch hardened gears will carry twice the load of unhardened ones. It is probably true that a properly torch hardened gear made of the correct material will carry at least twice the load of a gear made in the same material unhardened; but it is by no means true that any gear torch hardened will carry the same load as a gear of the same size made in a better material unhardened.

Another mistake which many have made is to assume that because a gear is torch hardened it will stand great abuse and that it is not necessary to mount it properly or lubricate it properly. A torch hardened gear with only a 30% bearing surface on the teeth cannot reasonably be expected to be better than an unhardened gear with 100% bearing surface on the teeth. It may be

(Continued on page 28)

Practical Cutter Grinder Set-Ups

By
HAYWARD GAY
Detroit Office
and ADAM FATH
Tool Maintenance Department
CINCINNATI MILLING MACHINE CO.
& Cincinnati Grinders, Incorporated

PERISHABLE tools represent a major investment in any shop, and are an important item of cost in producing machined parts. It is therefore quite obvious that economical plant operation necessitates the longest possible tool life consistent with rapid production. Ordinarily, the user obtains for his tools a fair amount of protection against breakage or burning from excessive speeds and feeds either through the voluntary action of the machine operator or through an elaborate time study system. Their efforts, however, may be completely nullified by careless sharpening of the cutters. Aside from design features, materials, possible damage while in use, etc., cutters must be correctly sharpened to the proper clearance angles and keen cutting edges, and the face and flank surfaces must be smooth to minimize opposition to the flow of the chip. In other words, cutting tools must be properly maintained to keep the cutter cost per unit produced as low as possible.

Many factors are involved in the proper maintenance of milling cutters, not the least of which is sharpening. Several of these sharpening operations are briefly outlined in this article. The operations chosen, which are based upon the data accumulated from many years of practical experience in the plant of The Cincinnati Milling Machine Co., are rather difficult without actual experience with the type of cutter under discussion. Throughout this article, it should be born in mind that all set-up references are to a Cincinnati No. 2 Cutter and Tool Grinder.

Tungsten Carbide Face Mills

To obtain the best possible finish with a tungsten carbide face mill, several precautions must be observed to produce the required accuracy for the cutting edges.

Accuracy of the grinding equipment exerts an important influence on the accuracy obtained in the cutter, and consequently on the grade of finish produced on the work. To assure the best results, the face of the cutter grinder arbor which supports the face mill should be ground in position on the machine headstock. If the arbor is removed for any reason whatever, it should again be circular ground before a face mill is mounted upon it.

The surface at the rear of the face mill which normally contacts the face of the milling machine spindle nose must be absolutely flat. It should be given a conventional flat bearing test with a rubbing block. If the bearing surface of the cutter is not flat, it should be scraped and then lightly lapped.

Two types of wheels should be used; a green grit cup wheel for the soft base, and a diamond wheel for the carbide insert. Grind the base material to a secondary clearance angle of about 70°, (See Fig. 1) extending slightly into the carbide tip. This prevents the diamond wheel from contacting the soft steel, and consequently it will do a better job of grinding the kind of material for which it is intended—tungsten carbide.

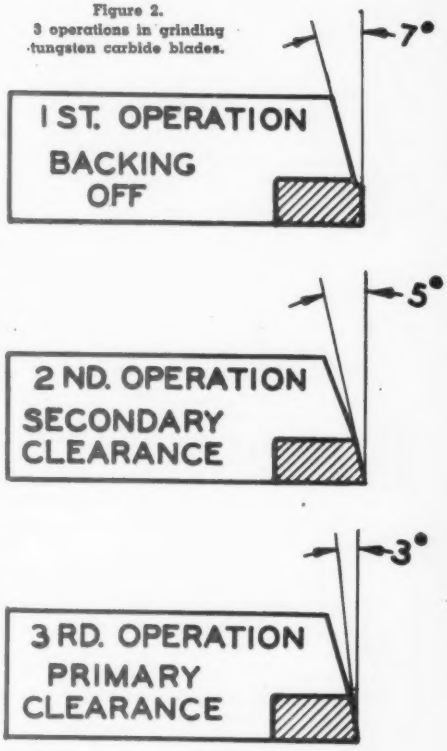
For the secondary clearance with the diamond wheel, light cuts should be taken; .0005" for the rough cuts and .00025" for finish. (Fig. 2) An experienced operator can tell when all blades are ground to a uniform height by the grinding sound.

For the primary or cutting clearance, .0001" should be removed each cut until the cutting land is .006" to .008" wide.

After the face of the blades are completely ground, and before the cutter is removed from the arbor, it should be checked with a light gage (Fig. 3) to assure all blades being finished flat and to the same height. A second inspection of the blade height should be made with an accurate indicator gage while the face mill is supported on a test block. When this condition is fulfilled,

(Continued on page 30)

Figure 2.
3 operations in grinding tungsten carbide blades.



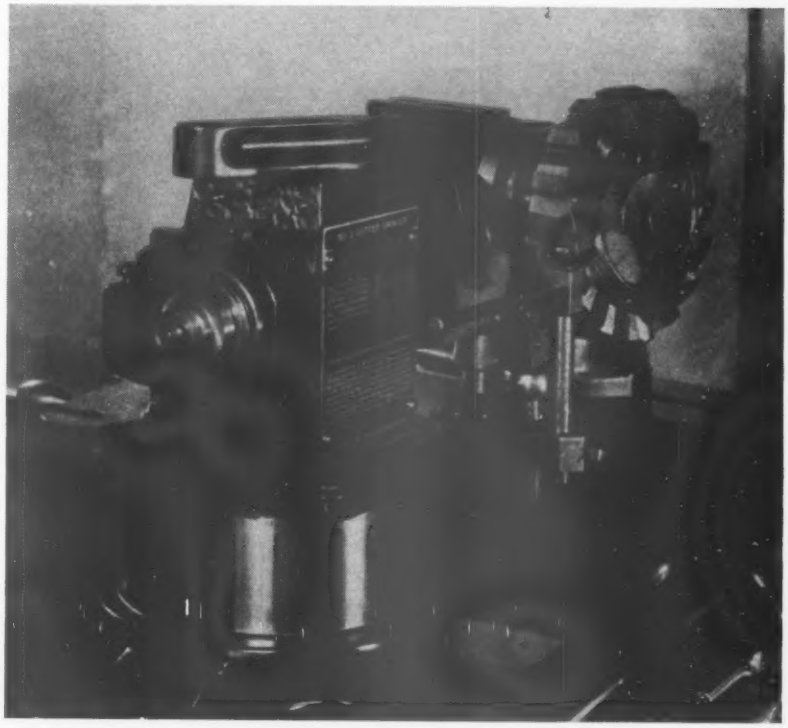


Figure 1. Cincinnati No. 2 Cutter and Tool Grinder

Low Production *Stamping* Problems

By WILLIAM J. DUNN
MOTORS METAL MFG. CO.
DETROIT, MICHIGAN

There has been much publicity regarding volume stamping production, which inevitably makes the low volume manufacturers obscure individuals. Facilities are available with large corporations so that production lines are set for an indefinite period. Much depends on the sales department's ability to dispose of the various products. Machinery and other equipment are bought many months in advance and in most cases schedules are set with anticipation of a fixed goal.

After schedules are made known to the various department heads they in turn plan progressive lines and every move is made toward volume production. How and when the other departments may operate is not interesting to them, each division and department head is primarily interested in obtaining a maximum efficiency as standardized by their cost and standards departments. These departments function and are combined with time study groups. Previous years routing and operation sheets are compared, and after careful planning of plant equipment to produce the part, it becomes the entire responsibility of the various department heads to produce at cost whatever is submitted to them. Money is then appropriated, the product must be produced at the cost agreed upon.

This procedure varies in its entirety when production is low. In most cases quotations are submitted with the major intention of obtaining the various parts without expensive tools, no additional machinery, no progressive lines, and in many cases no improvised dies, etc. There is an unlimited field to the individual who can cut corners, enabling necessary production without the appropriation of additional funds. The jobbing stamping man of today is invariably asked why dies are always needed to produce stamping products. He is a genius in-as-much as in many instances his dies are only a replica of a high volumed tool. To make his prices attractive he must devise many ways to operate. Sometimes he will make wooden dies, then again use stock dies, these tools are then stored away which in itself through the years becomes a storage problem.

Low volume production makes it necessary to replace set ups and operations frequently. Lost time during these periods is difficult to replace against the selling price of an individual product, an over-produced part is an increased menace with an under-produced one, this also requires careful planning because customers are usually adamant on quantities. The large corporations at the end of each season can take surplus parts and deliver to their service divisions, but the jobber lives in hope that he can dispose of them at an even cost with no profit.

Regarding materials he has an even greater problem, carrying low inventories makes prices higher when production is unexpectedly curtailed at the larger plants, he is then obliged to hold large stocks of undelivered and finished parts, until new releases are forwarded to him, making this another storage problem. Large traffic departments are maintained to deliver parts at all times, with fleets of trucks on hand to assure the customers reasonable service. The jobbing management of today has to keep impressed on executives and men that any suggestion to cut corners is acceptable at all times. Many employ human relation engineers to study intellectual traits, executive courses are planned and carried out at considerable expense. During the conferences much discussion bears on how competitors operate against their own standard of procedure, and the feeling remains that much is learned from these conferences, and when all this routine is staged against low production profits both management and personnel are to be assured of a successful business year.

This is, providing of course that operations show on the black side of the ledger. It's a headache all through but the jobbing stamper still thrives on it.

Continuing the methods of low production as used by the jobber we are confronted with the problem of the "Rolled Fender;" where a truck fender or small run of passenger car stampings are required, naturally to include a costly set of quality tools the eventual product would have to be sold at enormous cost, to defray the many expenses involved, therefore the rolled fender is introduced which eliminates dies and costly press equipment. The assembly of such parts would be to roll the crown only to various contours and shapes, then a valance or apron is welded on and the fender then completed with smaller hand operations, such as piercing, etc.; sometimes an improvised die may be used where a distinct reverse is shown on the rear or running board end of the fender.

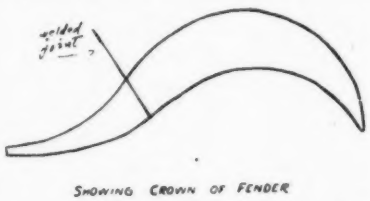


Figure 1

Another of the many short cuts which is essential to low production is the stock piercing die which produces any size hole with various spacings, provided of course that the required holes would be in line with each other or have parrallel centers as illustrated in figure 2.

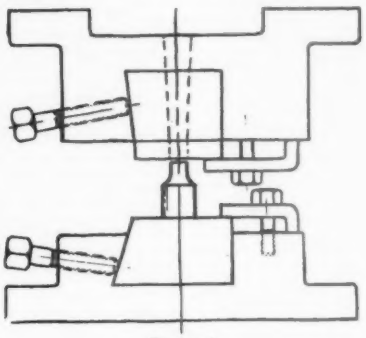


Figure 2

Then to answer the purpose of irregular piercing holes, the part or panel could be marked and centerpunched and then pierced by using the pilot piercing punch as shown. The panel being held against the punch, figure 3.

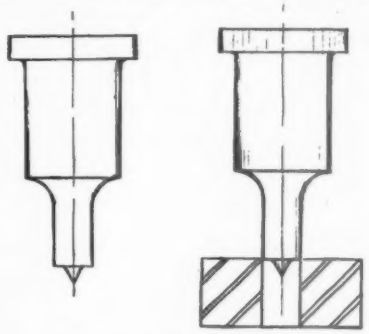


Figure 3

Surplus material stocks are carried to assure the various production departments of material to complete short orders, instead of purchasing direct from the mills, these methods eliminate much cost and thus avoid small quantities in special sizes.

The practice of ball bearing surfaces on rotary and square shearing machines has been much in evidence of late, thus insuring more accurate work by the operator and above all eliminating scratches on material which are detrimental to metal finishing.

Where material is being square sheared to length and width such as hood tops and sides a gage is set on

(Continued on page 46)

Production Perspectives

News of Mass Manufacturing from Everywhere

According to a study issued September 19 by the statistical division of the National Industrial Conference Board, **world industrial production has been rising moderately** during the past few weeks. **Improvement was recorded in the United States,** Germany, Canada and Holland. **Great Britain, France, Italy, Belgium and the Scandinavian countries showed losses.** A composite index of foreign industrial production indicates that the sharp contraction that began in December, 1937 was checked, temporarily at least, in May and June, the survey said.

In the wake of an upturn in **steel mill operations in the Pittsburgh aera,** general business activity in that section **has recovered to around its early March levels,** but most officials feel that the upturn must receive more nourishment than it has in the past few months, if the present gains are to be held.

From Wilmington, **Delaware, an upswing of 3 per cent in employment** and payrolls for Delaware factories **is reported. Plant activity is even more marked,** climbing 6.9 over June. The index for employment rose from 84 to 86.6 and payrolls from 68.3 to 70.2. Employee-hours climbed from 60.7 to 64.9. All three indices, however, were roughly 30 per cent below July of a year ago.

Industry in Philadelphia today is employing more people than it did in 1936, and 53 per cent of the business and financial houses and manufacturing plants employ as many, or more, people today than they did a year ago. Despite the depression and the layoffs of last year, more persons are drawing weekly pay checks today than they did two years ago when business was "boom minded" and all indices point towards a greater recovery program. However, while the unemployment situation in Philadelphia, undoubtedly is still serious, apparently it is making a steady improvement. It is reported that the number of employed of Philadelphia today is 4 per cent greater than it was in 1936 although it is still 5 per cent below the total of last year.

Midwest

A **bright spot** on the industrial map during September was **Michigan,** where 59,0000 **workers returned to their jobs with indications pointing towards a steady increase in reemployment in Michigan industry as production gets under way.** Wm. S. **Knudsen,** President of General Motors Corp., **predicted that automobile production for 1939 would show an increase of from 25 to 30 per cent over 1938.** Mr. Knudsen based his prediction "on the fact that new and used car stocks are so low."

Household **vacuum cleaner sales**

J. R. Weaver, Vice president of A.S.T.E. and Director of Equipment, Inspection and Test for Westinghouse at East Pittsburgh, will in addition to his present duties be responsible for equipment negotiations, according to a recent announcement of T. I. Phillips, General Works Manager.

first seven months of this year were the **third highest for the period having been topped only in 1936 and 1937,** according to C. G. Frantz, executive secretary of the Vacuum Cleaners Manufacturers Association. January-July sales this year were 747,838, compared to 1,083,170 same period of 1937.

The Crosley Radio Corp. called a special meeting of stockholders, September 23, to vote on proposed amendment of incorporation articles to permit possible entry of the company into the automobile field. Letters sent to stockholders said the purpose of the amendment was to "broaden the activities in which the company is authorized to engage, so that the company would be able if conditions warrant, to enter the automobile industry, when, such entry appears desirable." The amendment proposes to drop the name "radio" from the company title.

Alfred G. Gulliver, former manager of the Chevrolet plant at Toledo, **is now head of the big engine and axle plant of Chevrolet in Buffalo.** This **plant went into action September 12 and announced plans to triple its output.**

Lockheed Aircraft Corporation announces an order for two 10-passenger Electra Airliners from the MacRobertson-Miller Aviation Corporation, Ltd. of Perth, Australia. The order followed decision of the company to speed its air mail and air travel in Northwestern Australia. **The airliners will cost $117,000,** will have a top speed of 210 miles per hour and a cruising speed of 195 miles per hour. Delivery will be made early in 1939.

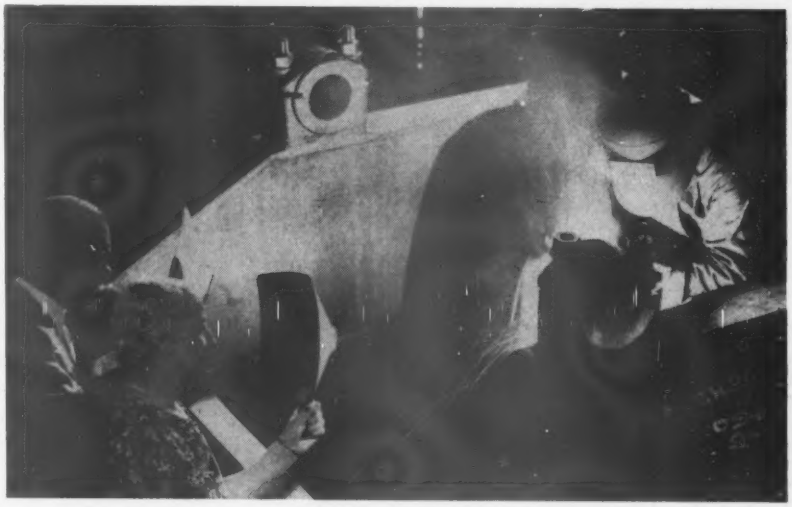
The **annual convention of the Associated Machine Tool Dealers of America,** will be held **at the Hotel Alms, Cincinnati, Ohio, on Monday and Tuesday, October 10 and 11.** Cincinnati is the birth city of this organization which was founded there some fifteen years ago. **A. G. Bryant,** of the Bryant Machinery & Engineering Company, Chicago, **is president of the organization.**

NEW ENGLAND

For the second consecutive month, Bridgeport payrolls have shown an increase over the previous month. Factories in Hartford County **increased their working forces** during August and early September and **many have stepped up work-week schedules,** according to Sidney E. Cornelius, man-

(Continued on page 36)

Eighteen months ago The James F. Lincoln Arc Welding Foundation was established and $200,000 was offered in prize awards for the best papers submitted to the foundation on welding in its many phases. The awards have now been made, first prize in the jigs and fixtures division being awarded to James T. Lewis, Assistant Works Manager of the Cleveland Crane and Engineering Company. The Grand Award of the Program, went to Mr. and Mrs. A. E. Gibson, shown below, of the Wellman Engineering Company, Cleveland, Ohio. The authors, jointly, received $13,841.33. The thousands of papers submitted were judged by 31 engineering authorities throughout the country.



Chapter Doings

George R. Keller, A.S.T.E. Editor

BIG news of the month in the affairs of A.S.T.E. is the election of Prof. John J. Caton, Director of Chrysler Institute of Engineering, to honorary membership in The Society. Prof. Caton was presented with this honor at the meeting of Schenectady chapter, A.S.T.E. on September 15. On numerous occasions Prof. Caton has addressed various chapters of The Society and supported many of its activities, acting as host to the entire Detroit Chapter last year, when the chapter made a tour of inspection of Chrysler facilities, research laboratories and testing equipment. Prof Caton is the second one to be so honored. John Younger, Head of Industrial Engineering at Ohio State University, was the first to be so honored in 1935.

The past several weeks have been busy ones for National Officers, who have personally contacted as many as possible of the twenty-two chapters which now comprise the national body. President Wagner met with Cincinnati, Detroit and Toledo Chapters. Vice-President James R. Weaver, contacted Pittsburgh, Philadelphia, Syracuse, while George R. Smart, Second Vice-President attended the September meeting of Cleveland and Cincinnati. Secretary Charles F. Staples met with Chicago and Dayton Chapters. Executive-Secretary Lamb was present for meetings at Hartford, Bridgeport, New York, New Jersey, Baltimore and Schnectady chapters. Each of these officers explained in considerable detail the Semi-Annual Meeting to be held in Pittsburgh October 14 and 15, the workings of the national office, chapter operations, told of the forthcoming Machine & Tool Progress Exhibition next March, and gave most interesting talks on the development of Tool Engineering as a profession, the growth of The Society and the relationship of Tool Engineering with Society and Social advancement. Enthusiastic endorsement was given to these officers for their talks and it was indicated by various chapters that a much closer working arrangement and understanding would result from this contact with "headquarters."

Pittsburgh Chapter held their September Meeting with Chairman G. P. Grace back at the helm and fully recovered from his illness of last spring. Glad to hear that you are back in circulation again G. P. The Pirates are on the loose with J. R. "Buck" Weaver leading them. They swear to "bring in alive" more Tool Engineers at the Semi - annual Meeting than have ever been "captured" for this event before. Glenn Thompson will look after the Golfers; John Goodman taking charge of Indoor Sports. Ray Artz will look after the Related Activities, (Visiting Ladies) never heard the term before, but these ASTE'ers are an ingenious lot. Better plan to be in Pittsburgh for the Semi-Annual. There are many things of interest to be seen. Ye Editor spent two years there and still remembers several of them (?)

Bridgeport started its Fall Meetings off with a bang on September 8th. Our own Ford Lamb did the braodcasting. He must have done a great job because my spy said some very nice things about him. In fact, too nice for print. A. W. F. Green, Development Engineer, Ludlum Steel Company presented a Sound Movie on Stainless Steel. Sounded so good that the Chapter is petitioning St. Peter to cover the Pearly Gates with this Gleaming Metal.

Detroit Chapter opened its Fall Meetings on September 8th with Prex. Wagner doing the shouting and did he shout about the Semi-Annual. The Right Honorable Secretary Smith made the first speech of his career and then chose the distasteful subject of "Delinquent Dues." L. C. Gorham, Gorham Tool Co., Detroit, expounded the virtues, "Tool Steel Formula Standardization." All A.S.T.E.'ers that are interested in this subject are invited by Mr. Gorham to present their views. The Tigers have chartered a complete caravan for the pilgrimage to Pittsburgh, 200 strong. That gives the rest of us something to shoot at.

Toledo has not started with its Fall Meetings. The Mud Hens are breaking out with a card party in October.

Milwaukee started off with a fine meeting in September. These "Brewers" really do things. Movies by Crane Co. and Waukesha Motor Co. were very interesting. Emmor Houston is in the hospital with Hay Fever. Here's hoping, Emmor, that by the time this goes to press you will not be "sniffling" around the hospital any longer.

Cleveland started its program with a meeting on September 13th at Germania Turnverein Vorwaerts Hall. Another one like that, Glenn, and Russ Oswell will be telling us all something. George Smart has emigrated from Milwaukee to Cleveland. You fellows should be mighty proud to have him in your midst. The boys all extend Best Wishes to you, George. Chet Goddard has Best Wishes for success in his new job at Columbia Axle. Hark ye! The Indians have cut loose. They are starting a Student Chapter with Headquarters at Fenn College. I'll bet that makes the other A.S.T.E.ers perk up. L. A. Trofimov, Products Development and Engineering Co., spoke on "Research Engineering." He stressed the importance of tackling engineering problems from all angles and with an unbiased viewpoint.

Matrimonial News—Bill Dinger, N.Y.-N.J. Chapter, was married on Aug. 27. The lucky girl was Mary R. Rutz of Wilkes-Barre, Pa. Bill hails from Cincinnati and lives in East Orange, N. J., which makes him a real member of the "Cosmopolitan" Chapter. Here's luck, Bill, and may your troubles all be tool engineering problems.

Buffalo Chapter had its Second Annual Stag Outing at the Buffalo Trap & Field Club on August 20th. There were plenty of refreshments for all. Chairman Taylor and Picnic Chairman

DAY DREAM . . . —*By Bob Steinmetz*

Tauser were on the job at noon to extend the glad hand to about 180 members and friends. There were a lot of games and prizes. Joe Roth won the gate prize (fishing reel). Too bad, Joe, now you will have to buy a pole and license or give it to a relative. J. D. Reep was in charge of games. Did he have fun! Nothing but. Ernie, you are misleading our Public. You would like us to believe that you missed only the 75 yard dash by going down in the basement for refreshments. One of my spies informs me otherwise. The picnic was a success in every way. Some of the Bisons got into the clover but as a whole they did most of their grazing in the short grass. The September Meeting was also held at the Trap & Field Club. Chairman Taylor stressed the importance of attending the Semi-Annual at Pittsburgh. E. J. Bryant, Greenfield Tap & Die Co. spoke on "Guages & Tolerances." A lively discussion developed after the meeting.

Rochester opened the season with a meeting at the Culver Arms on Sept. 13th. A sizeable turnout attended to hear Prof. John J. Caton's broadcast on the subject "Is a College Education Necessary?" Dean Caton is Director of Chrysler Institute of Engineering. His address must have been a "Wow" because my "Redwing" spy sent a two-page report. Time and space will not permit the complete report but your humble editor is going to be at the listening post to hear Dean Caton at the very first opportunity. How about the Redwings and Bisons going to the Semi-Annual together? Why not?

Syracuse broke out with a Clam Bake on September 10th. The Chiefs must have had a great time. Their regular meeting was held on September 14th and Prof. Caton gave the same broadcast that he delivered to Rochester the night before. The Chiefs are getting all set for the trip to Pittsburgh. Walter Roe and Ray Adams are making the arrangements. Why not chuck your lot in with Rochester and Buffalo? We could all leave from Buffalo together and that will give the International League some real representation.

Baltimore opened on September 12th. It is evident that the Orioles (International League) got aff to a flying start with a big crowd, a good dinner and an excellent speaker in the person of Charles L. Burns ex-British Royal Air Force Flier and now with Pratt & Whitney Aircraft. His lecture covered the hi-spots on Aircraft Engine Tooling. Harry Corrigan, Glenn L. Martin Aircraft Corp., gave a few inside stories about his illustrious brother "Wrongway Corrigan." Our own Ford Lamb was there also and gave one of his usual good broadcasts, also doing a little plugging for his Colleague, J. R. "Buck" Weaver. The man to drop the first bomb from a Martin Bomber in active service, Mr. Barlow, gave a short but interesting talk. Captain Hamlen, U.S. Navy, Retired, Glenn Willhide, Ch. Engineer, Black & Decker Co., and Mr. Miller, Bureau of Standards were also guests. That's swell Mac. It goes to show that we do have a lot of the "Big Shots" interested.

NEW A.S.T.E. BOARD TAKES OFFICE OCTOBER 1, 1938

All chapter chairmen and five past National Officers are now automatically elected to Board of Directors, according to the recent amendment to by-laws. These men are:

John S. Bartek	Consolidated Machine Tool Co.
Luke E. Beach	Packard Motor Car Co.
Eugene Bouton	J. I. Case Co.
C. Ray Brunner	Dodge-Chrysler Corp.
Frank R. Crone	Lincoln Motor Car Co.
E. W. Dickett	Sundstrand Machine Tool Co.
E. A. Doogan	Hussmann-Ligonier Co.
Chester A. Dundore	Underwood Elliott Fisher Co.
Floyd W. Eaton	Burroughs Adding Machine Co.
August Ehrhardt	Spicer Mfg. Corp.
E. W. Ernest	General Electric Co.
Gregory P. Grace	Robertshaw Thermostat Co.
Conrad O. Hersam	Industrial Cons. Engineering Co.
I. F. Holland	Pratt & Whitney Div., Niles-Bement Pond Co.
Clifford E. Ives	Clifford E. Ives Co.
Earl V. Johnson	Firth Sterling Steel Co.
Nils H. Lou	The Glenn L. Martin Co.
A. H. Mitchell	New Process Gear Co.
Gordon L. Reed	York Corrugating Co.
Paul F. Rossbach	Eaton Manufacturing Co.
Eldred A. Rutzen	Cutler Hammer Inc.
C. Frank Sheeley	Hyatt Bearing Div. of G.M.C.
Frank A. Shuler	Chrysler Corp.
Howard C. Taylor	Acme Pattern & Machine Co.
Walter F. Wagner	Lincoln Motor Co.
Louis L. Weber	Lodge & Shipley Machine Tool Co.
George W. Wise	Minneapolis-Honeywell Regulator Co.

Where do A.S.T.E.ers in **Chicago** stand? It it the "Cubs" or the "White Sox?" At any rate the second Golf Tournament was a "bear." Otto and Harry (I wouldn't give you away) tied for a prize with a score of 75. Watch out for them, boys, they're some "Gophers." Another tournament is in progress but at this writing the date has not been set. One hundred and fifty turned out for the first regular fall meeting on September 12th held at 84 E. Jackson Blvd. They took a leaf from the National Convention Committee's Book and instituted the "Smorgasbord" in the Windy City. No foolin' it was a success. Our National Secretary, Charlie Staples, was there and will vouch for this statement. Charlie's broadcast covered the activities of the Detroit Chapter, of course. He put in a "Plug" for the Semi-Annual. Mr. K. Burg of the Du Pont Corp. gave a very interesting talk on "Cyaniding" in addition to the slides and movies shown by him. Ed Johnson was there and is he a booster. Brought along 16 fellow employees from Crane Co. International Harvester boys were conspicuous by the size of their delegation. Quite a few of the boys are attending Rockford's Birthday Party on September 29th. The Officers and Committees held a meeting on September 19th to plan the season's activities. Plans are being made for a large attendance at the Semi-Annual. We'll be looking for you "White Sox" or is it the "Cubs?"

The **"Cosmopolitan" Chapter, N.Y.-N.J.** opened the season with a real meeting held at Hotel Robert Treat, Newark, N. J. (International League). Well over 200 listened to John H. Van Deventer, Editor-in-Chief of Iron Age, deliver a very fine address. Can't say too much as he will be one of the headliners at Pittsburgh on October 14th. Those attending this meeting will enjoy his homely wit and keen philosophy. Our own Ford Lamb was there also and gave a sermon on the growth of the Chapter which has grown from less than 50 to a membership of 183 in less than a year. Bill Dinger, the Benedict, promises a membership of over 200 by the first Anniversary. Go get 'em, Bill. Tom Orchard, the guy who put across 2 good parties, both socially and financially, pulled a bang-up promotion stunt. In order to put the proper enthusiasm back of the Golf Tournament scheduled for September 24th, he brought Wright Aeronautical's Hill Billy Band in to give the boys a sample of what they may expect at the dinner following the sports events. There was a Parade of Trophies to be won in addition to some very nice prizes. Hark ye! Hark ye! Here is another Chapter that has its program all in order for the entire season.

Racine is not going to bat until October 10th at which time they expect a bang-up turnout. Let's have the dope

(Continued on page 40)

October Chapter Meetings

Chapter Meeting Announcements must be received on or before the 20th of preceding month to appear on this page. Members and friends of The Society contact Chapter Secretaries for meeting details if your announcement does not appear below.

BRIDGEPORT

October 13, 1938—6:30 P.M. Dutch Treat Dinner, Hotel Barnum. 8:00 P.M. Allen Mfg. Company will present a film showing the manufacture of the Allen hexagon socket head screw and its application to tools.

BUFFALO

October 10, 1938—7:00 P.M., Buffalo Trap & Field Club, dinner, $1.25, members and guests.

Speaker: G. M. Class, Gisholt Machine Company.

Subject: "Turret Lathe and Automatic Chucking Machine Tooling."

Reservations: Wm. Weinreich, 649 Minnesota Ave, Buffalo.

CHICAGO

October 10, 1938—6:30 P.M. Dinner, Harrisons Air Conditioned Restaurant, 80 E. Jackson Blvd. 8:00 P.M. Technical Session.

Speaker: Dr. Ihrig.

Subject: "Silicon Impregnation of Steel."

Reservations: Mail to Harrison's Restaurant, 80 E. Jackson Blvd.

CLEVELAND

October 11, 1938—Dinner, 6:00 P.M., Germania Turnverein Vorwaerts (German Club), 1622 East 55th St., Technical session, 8:00 P.M.

Speaker: Mr. K. C. Monroe, of Lapointe Machine Tool Company, Hudson, Mass.

Subject: "Broaching" from its inception up to and including present day methods, also surface broaching, together with lantern slides.

Reservations: Dinner a la Carte—Those desiring full course dinner ($1.00) make reservations with H. P. Boggis—Endicott 3611.

HARTFORD

November 7, 1938—Dinner, 6:30 P.M., City Club, Allyn and Trumbull Streets.
Technical Session 8:00 P.M. Gas Company Auditorium, Pearl Street.

Speaker: Mr. Chris. H. Borneman, Supervisor, Tool and Gage Service Department, Schenectady Works, General Electric Company.

Subject: Mr. Borneman is well known to a large number of Hartford members who will look forward with keen interest and pleasure to his talk on tool and gage service in a large plant.

MILWAUKEE

October 6, 1938—Dinner, 6:30 P.M.
Technical Session, 7:30 P.M.

Speaker: Mr. Milt Schmidt, Kearney & Trecker, Inc.

Subject: "Milling Machines—Tooling Methods."

NEW YORK—NEW JERSEY

October 10, 1938—Dinner, 6:30 P.M., Essex House, Newark, N.J.
Technical meeting, 8:00 P.M.

Speaker: S. C. Spaulding, American Brass.

Subject: "Selection of Steels, Design and Heat Treatment of Tools and Dies."

Speaker: J. J. Crowe, Air Reduction Sales Co.

Subject: "Flame Hardening."

PHILADELPHIA

October 20, 1938—Dinner, 6:30 P.M., $1.50 a plate.
Technical Session, 8:00 P.M.

Speaker: C. W. Lucas, Chief Engineer, Ferracute Machine Co., Bridgeton, N.J.

Subject: "Deep Drawing Dies, Presses and Pressures."

RACINE

October 10, 1938—6:30 P.M., Racine Country Club.

Speaker: W. K. Bailey, The Warner & Swasey Company, Cleveland.

Subject: "Turret Lathes and Telescopes."

Reservations: Contact before noon, October 10, Chas Merrill, phone J-632, or H. E. Munch, phone J-3513.

ROCHESTER

October 11, 1938—Dinner at 6:30 P.M., $1.00, Todd Union, U. of R.
Technical Session at 8:00 P.M.

Speaker: George M. Class, Gisholt Machine Co.

Subject: "Turrett Lathe and Automatic Chucking Machine Tooling," with slides

ROCKFORD

October 20, 1938—5:00 P.M. at Faust Hotel, entire eleventh floor, Dinner.
Technical Session.

Speaker: W. H. Oldacre, Pres. of D. A. Stuart Oil Co.

Subject: "Cutting Fluids and Their Effect on Machinability."

Also, Prof. Oakes of Wisconsin on "How to Become an Inventor."

Reservations: Allis Chalmers Electrical Division in Talcott Bldg. Phone Main 6270.

SCHENECTADY

October 13, 1938—Rice Hall, General Elec. Co., Schenectady, 8:00 P.M., no assessment.

Speaker: Geo. M. Class, Gisholt Machine Company.

Subject: "Tooling of Turret Lathes and Automatic Chucking Machines," with slides.

Members—Bring a guest.

SYRACUSE

October 12, 1938

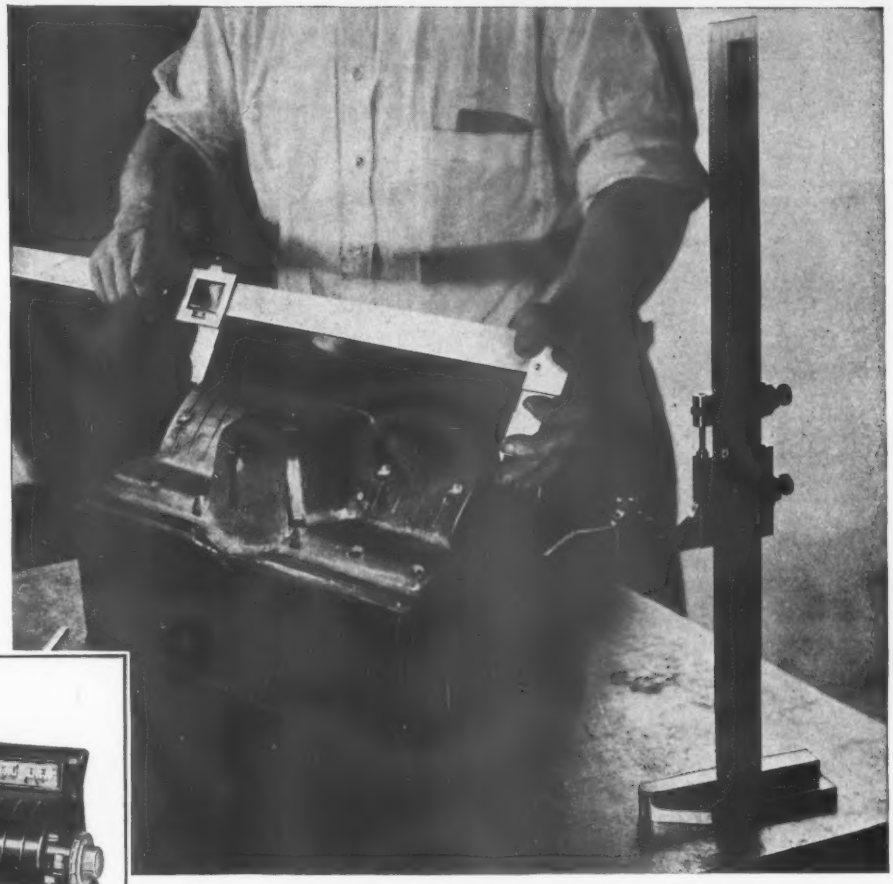
Speaker: G. M. Class, Gisholt Machine Co.

Subject: "Turret Lathes and Automatic Chucking Machines."

TOLEDO

October 28, 1938—Toledo Yacht Club, costume Halloween dance and card party.

There will be costume, door, and table prizes, a good orchestra for dancing, lunch for the hungry ones, tables for the card fans, and fun for all. Tickets at 50c per person may be obtained from Lorence E. Rennell, 206 Crawford Avenue, Toledo. Business phone La-2161, Residence phone Je-2900M.



Checking the inner half of the plastic mold for the Oldsmobile Instrument Housing (shown below). The tools are Starrett Vernier Caliper No. 122 and Starrett Vernier Height Gage No. 454.

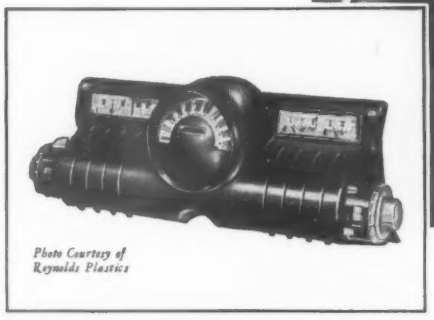


Photo Courtesy of Reynolds Plastics

for SAFETY plus CONVENIENCE

STARRETT SHOP EQUIPMENT TOOLS

"Greater Safety, Greater Convenience" — that's why Oldsmobile adopted their new instrument panel — and appropriately enough, the men who made the molds for the plastic housing used Starrett Tools for layout, production and inspection to safeguard accuracy and insure maximum convenience in making the many precise measurements involved. The complete line of Starrett Vernier Calipers and Gages and more than 3000 other fine precision tools and dial indicators are shown in the new Starrett Catalog No. 26T. Write for a copy.

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

World's Greatest Toolmakers — Manufacturers of Hacksaws Unexcelled — Steel Tapes, Standard for Accuracy — Dial Indicators for Every Requirement

Standardize on

BUY THROUGH YOUR DISTRIBUTOR

A Way to Get Maximum Service from Standard Flat Milling Cutter Blades

SMALL economies, multiplied, make big dividends and in these days every item of possible cost reduction is important in the life of the Tool Engineer and of the production superintendent.

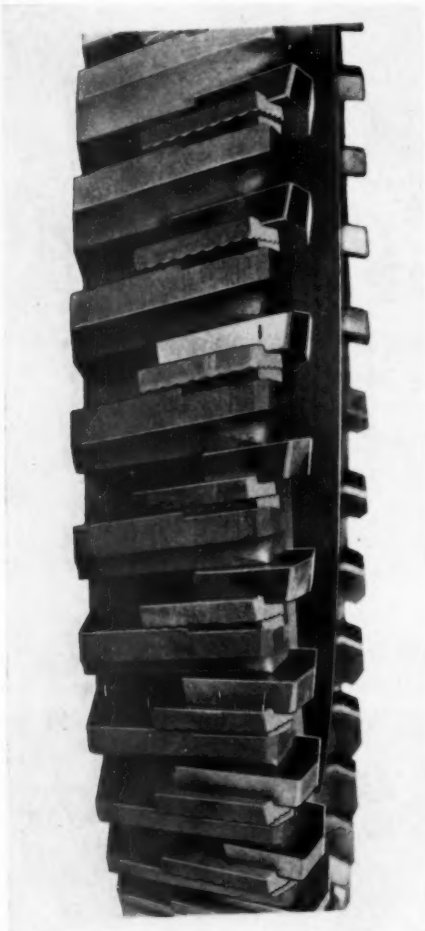
In one of the Detroit plants of one of the world's largest motor car manufacturers they were selling as scrap about 40% of the special alloy metal bought in the shape of milling cutter blades, because a cutter blade has to be discarded when repeated grindings shorten it to a point where the original locking device will not hold it in the cutter head. That's expensive—buying special alloy at blade prices and selling half of it as scrap.

Then along came a new cutter head with a means for locking these ground-down blades securely, lengthening their useful life by 50%, by using the high quality, high priced special blades down to mere nubbins.

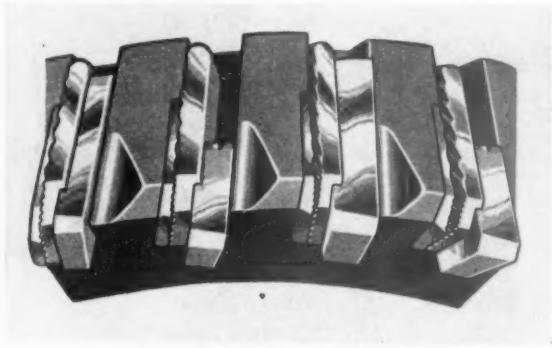
These special milling cutters, produced by the Gairing Tool Co., Detroit, Mich., have extra wide slots milled wide enough to receive the flat blade and the new locking device. The latter consists of a saddle which on one side rides the blade and on the other has milled serrations which engage the serrations on the Gair-Lock. The blade rests on the bottom of the slot and, by the peculiar action of the Gair-Lock, is subjected to pressure from four directions; thus it is securely retained and adequately supported in accurate position.

Saddles are available for positioning different lengths of blade, by steps of 3/16 in. Within any one position, blade adjustment is possible to accommodate from 13 to 16 grinds. Thus, when a blade has been reground 16 times, substitution of a different saddle brings it out far enough to take 16 more grinds.

It is thought that this new milling cutter head will be welcomed by users of special alloy blades, because of the increased service such blades will deliver when this new saddle type Gair-Lock head is used.



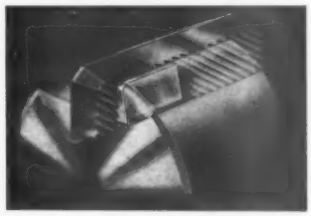
Note saddles accommodating various blade lengths. Patent applied for.



Method of locking blades in special Gair-Lock head. Blades can be used down to ½" in length. Patent applied for.

This locking method is an elaboration of the exclusive Gair-Lock announced about a year ago. A standard Gair-Lock head is slotted to receive blade and lock. Their adjacent faces are correspondingly serrated and both are inserted into the compound slot lengthwise. The lock is prevented from axial movement endwise by the shoulder of the retaining pocket, which takes the end thrust and causes the lock to move radially outward, automatically locking the blade securely at the bottom and sides of the blade slot.

This principal minimizes maintenance and facilitates blade setting, prevents blade shifting or tilting, affords positive lock, stop and adjustment, prevents chip interference at side of blade, eliminates serrating of cutter body.



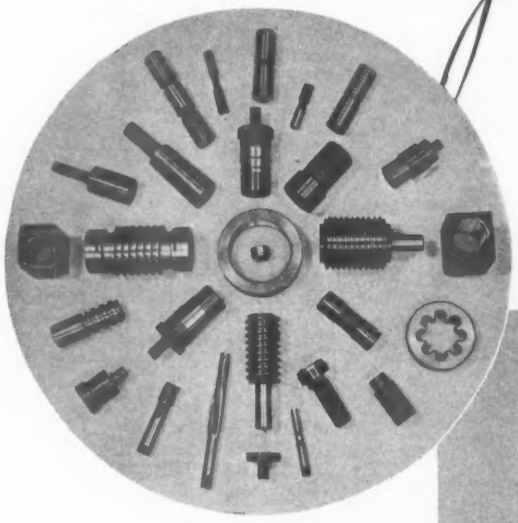
Method of locking high speed blades in standard Gair-Lock head.

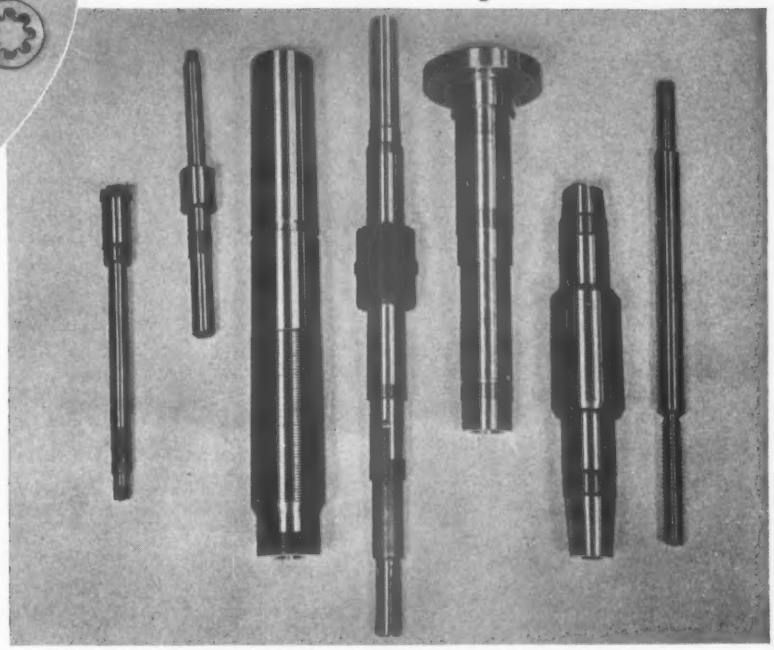
The application of this principle to flat blades as outlined above is achieved by the use of the serrated saddle introduced between blade and Gair-Lock, making unnecessary the grinding of serrations in the special alloy blades, a process that would be too expensive.

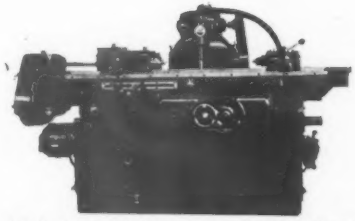
The Gairing Tool Company is working with a number of other users of milling cutters, designing cutter heads for their use with flat special alloy blades, particularly on roughing operations.

The Gairing Tool Company, 1629 W. Lafayette Blvd., Detroit, Mich., offers the Gair-Lock Milling Cutters and saddle type mills through their direct factory representatives in all industrial centers. The company maintains complete planning and engineering service and has developed many distinctive and individual special tools for intricate operations.

The long and the short of it!







J & L Automatic Thread Grinding Machine for long or short work requiring ground threads.

ABILITY to handle a variety of work is always useful. The J & L Automatic Thread Grinder has this ability to a remarkable degree. Short work, long work; threads of small diameter or of large diameter; fine or coarse pitches; single or multiple threads, right or left hand; are all handled by this versatile machine.

The change-over time is low, which is important if the machine is to handle a variety of jobs. For taper threads, by inserting a hardened steel former of the desired taper, the machine, **without compensation for lead error,** will reproduce this taper on the work.

Standard attachments can be supplied at any time for grinding relief on fluted taps and hobs, for grinding annular grooves on hobs and chasers without lead and for grinding internal threads.

THE LONG AND SHORT OF IT, is that the J & L Automatic Thread Grinder, with its AUTOMATIC WHEEL TRUEING AND AUTOMATIC SIZING FEATURES, will produce your precision threads, in small lots or large quantities, at lowest cost.

Available in two sizes.

SEND SAMPLES OR BLUE PRINTS OF YOUR WORK FOR COMPLETE INFORMATION.

JONES & LAMSON MACHINE COMP ANY • Springfield, Vermont, U. S. A.

Handy Andy's . . WORKSHOP . .

You know, I'm all agog waiting for the train to start Pittsburgh-ward somewhere around midnight the 13th, and my program is all laid out. (Gosh, I hope the boss lets me off!) Anyway, I'm going to visit a bit, especially with John Nelson and some other chaps, then I'm going to play poker a bit—hoping that Dan K., M.A.A (they know who I mean) and that lucky guy from Krueger's is along—and then I may roll the bones if someone will stand by and tell me what to do. I know seven and eleven by now, but haven't got the hang of box cars and streamliners. Thank gosh for one thing!—The Man on the Flying Trapeze is in his dotage by now, but what a noise he made going to Zinzinnati! (Stet—gosh, Roy, don't you suppose I know how to spell Cin—wel, Troy then!) But it was lots o' fun, although I shiver every time I think of that guy who carried the cake of ice on his tummy. Was he hot?—or did he catch cold?

▼ ▼ ▼

That is my one vice (outside of smoking and taking my semi-annual drink) the annual poker game. Once a year I indulge, even if I have to use a pinochle deck and play for matches. I could tell you some funny stories about poker games, but we'll hold them for an intimate moment. Wonder if Gallant and Clark(son) will be in Weaverville, as Dave Forsman calls it? And Dickey? No connection whatsoever, by the way, but I met a chap today who said: "Ay t'ank so too." I've read about 'em in the comics, have heard the dialect on the stage, but never met the bona fide article in the flesh before. And believe it or not, a pleasant conversation brought out that he's from my own neighborhood over seas. But it's long years since I've been there, with remote chance that I'll ever go back. But oh, the lilt of heart that comes from meeting a "Guy from your old home town!"

▼ ▼ ▼

We sent out, some time ago, questionnaires re "The Tool Engineer." The replies on the whole were highly complimentary, all of which encourages the editorial staff to keep up a stiff pace. One comment, however, gave me food for reflection, nor can I altogether agree with the critic. "Cut out the back slapping," he said, in effect, "and give us more technical stuff." There really isn't any back slapping, in the sense implied. While "The Tool Engineer" is a high grade technical journal—and soaring toward leadership—it is also the official journal of the A.S.T.E. And, the Society has a soul, just as any corporation has a soul, delve deep enough; we leaven the coldly factual technical bread with the spice of friendliness and camaraderie. For a considerable proportion of our readers are members, or prospective members; to us, they are friends. And believe me, some mighty fine friendships have been cemented in this A.S.T.E. So, we'll just keep on being friendly; this is a friendly Society.

▼ ▼ ▼

From one thing to another, a discussion centered on the exchange of ideas, the topic brought up when one of the boys vaguely hinted at a new development. Pressed for details, he said. "Well, I can't spill the beans; the boss wants it kept a secret." However, a word to the wise being enough, the very results divulged the idea. And, in various guises, the same device is probably in use in a dozen plants. Now, personally, I can't see this secret stuff, although I respect and hold inviolate confidences imposed by my employers. It's just that, in the long run, everybody loses when new developments are kept under cover, the exception, of course, being the occasional patented appliance. Few, by the way, that aren't infringed or improved upon; we just can't have stagnation.

▼ ▼ ▼

I have, personally, played with hydraulics some thirty years, having been

(Continued on page 28)

Announcing!

A New Type QUILL BEARING

CARRIED IN STOCK

Features of Design

★ **ONE-PIECE channel-shaped outer race with rollers definitely retained.**

★ **Correctly proportioned rollers with husky curvilinear trunnions.**

★ **Rigid surfaces, accurately hardened and ground, confining rollers endwise.**

★ **Simplified design—No fragile parts—Easy to assemble.**

★ **High load carrying capacity—Minimum space requirement—Low cost.**

★ **Wide range of sizes carried in stock.**

BANTAM'S new *Standard* Series of *Quill (Needle) Bearings* offers many advantages over previous designs. The result of long experience in the production of billions of Quill Rollers, these bearings were designed for use—

1. Where loads are heaviest; 2. Where reliability is paramount; 3. Where lower cost is an important factor.

Bantam *Standard Quill Bearings* possess the same fine quality which Bantam has built into the Quill Bearings used on Diesel Powered Streamline Trains. Numerous outstanding features are listed at the left.

SEND FOR BULLETIN NO. 1035

If you are a user of *any* type of large capacity radial bearing in sizes ranging from ½" I. D. to 5" I. D., or if present plain bearings are not completely satisfactory, be sure to send immediately for Bulletin No. 103S containing full engineering facts.

BANTAM BEARINGS CORPORATION
SOUTH BEND, INDIANA
Subsidiary of THE TORRINGTON CO.
Torrington, Conn.

BANTAM BEARINGS
TAPERED ROLLER • • • STRAIGHT ROLLER • • • BALL BEARINGS

HANDY ANDY

(Continued from page 26)

in the game since my teens (we started young, them days) and believe that I designed the first—at least one of the first—of the modern hydraulic tools used in mass production. Only, we used water power, city pressure, the cylinders being big and brass lined. It cut production over previous methods from three minutes per unit to three per minute, was so successful that the customer ordered six more machines. One of the stipulations for the repeat order was that we furnish a complete set of drawings; to that proposition the boss demurred, would have refused the order if I hadn't sided with the customer. "Look here," I said, referring to the customer. "I know his breed, and either you give him a set of prints, which he only wants for replacement anyway, or he'll tear the first machine down, make his own drawings and build the extra machines in the bargain." That clicked, the buyer got the drawings, ordered the extra equipment and everybody was happy. Cooperate, and get results.

▼ ▼ ▼

You know, it's really remarkable, the advances made in machine and tool development the past twenty five years, the more remarkable considering that there is really nothing new after all, only refinements. Like the automobile engine; there hasn't been a radical change in gas engine design since Otto invented the four cycle, but what a whale of difference improved materials and refined construction has affected! From a general overhaul at 3500 miles to almost continuous service for 100,000 miles or more, from beau coup blowouts and punctures in a set of tires guaranteed for 3000 miles (just think!) to starting, with a mere check on pressure, across the continent on a set already gone six times that distance. Oh, the old days were fine enough, but we go onward, onward! On to bigger and better things.

▼ ▼ ▼

At that, I smile when I see some of the new (?) gadgets; I knew them well as a boy. Seems that even tools have their cycles, like toys that are resurrected every seven years or so. Which reminds me: A friend, rather inventive and with a flair for toys, granted manufacturing rights to a concern, stipulating his cut but quite forgetting to specify the production per year. As a result, the contractor shelved the novelty; when sued, proved that under the contract he was not obliged to make a single model, won his case. Watch out and don't get stuck that way; there just isn't any money in it. Well, that's that; now let's start for Pittsburgh.

Yours for Progress
Handy Andy.

LAST CALL FOR PITTSBURGH

(Continued from page 10)

unusually fine industrial talking moving picture will be put on for your pleasure and enjoyment in the Urban Room of the William Penn Hotel—or, perhaps you would like to play a round of golf with some of your friends and associates at the convention. This has been very carefully planned for you and Pittsburgh has some very excellent courses. Another treat is your opportunity to attend the Carnegie Tech and Holy Cross football game at Pittsburgh at this same time.

Again we extend to you a hearty invitation to join with us on this splendid occasion. Pittsburgh has many excellent facilities for your enjoyment and edification. This can be a most profitable and interesting trip and one you will long remember. Special cars have been arranged from many of the chapter cities. Detroit Chapter will charter a special train. Contact local chapter officers for complete information and details.

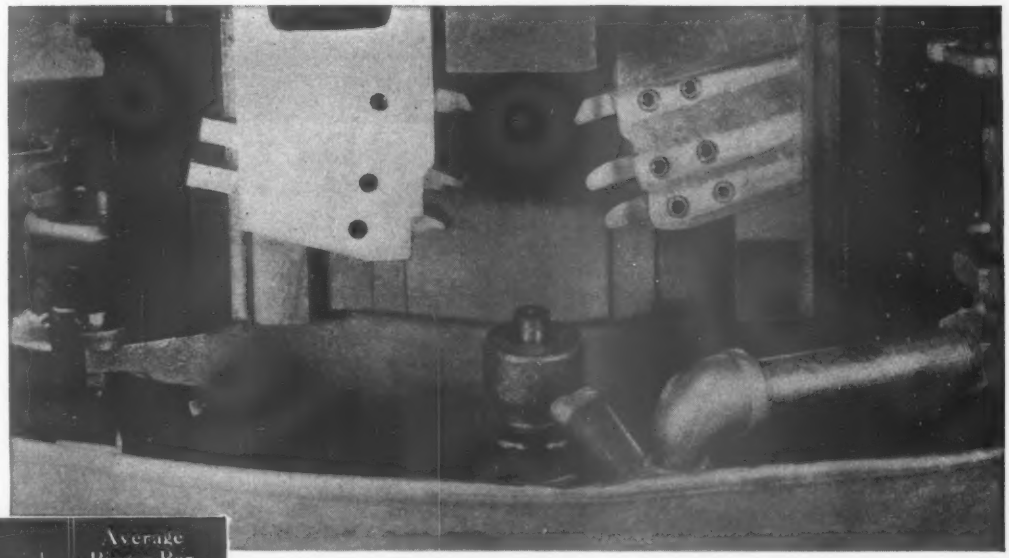
TORCH HARDENING GEARS

(Continued from page 16)

worse even than an unhardened gear; for if an unhardened gear is mounted out of alignment it will more quickly wear to a reasonably large surface contact than a hardened one. Gears hardened by any process should be mounted properly and made correctly. Torch hardening, or any other kind of harden-

(Continued on page 41)

52% more pieces per grind with *Haynes Stellite* J-METAL TOOLS



Haynes Stellite J-Metal tools set up to turn an automotive transmission gear.

Tool Material	Average Pieces Per Grind
Haynes Stellite J-Metal	146.6
Alloy A	96.5
Alloy B	94.0
Alloy C	89.2
Alloy D	72.5
Alloy E	36.6

For all materials, surface speed was 160 feet per minute with a feed of 0.012 inch per revolution and a depth of cut of 1/16 to 3/32 of an inch.

THESE six Haynes Stellite J-Metal tool bits are used to rough-turn the outside diameter of a transmission countershaft gear in an automotive plant. Before standardizing on Haynes Stellite J-Metal, the manufacturer compared its performance with that of five other cutting alloys. Haynes Stellite J-Metal averaged 52 per cent more pieces per grind than the next best material. The table at the left gives complete results.

Records such as this show how Haynes Stellite J-Metal increases production and saves machining dollars. Write for "Haynes Stellite J-Metal Cutting Tools," a 56-page operating manual on all phases of machining with Haynes Stellite J-Metal. It will help you determine how to use these superior tools profitably. There is no obligation.

PRODUCTS OF A UNIT OF UCC UNION CARBIDE AND CARBON CORPORATION

Many standard and special Haynes Stellite cutting tools will be on display at the exhibit of Haynes Stellite products at the National Metal Exposition, Detroit, Michigan, October 17-21, 1938. Plan now to visit Area B-216.

The words "Haynes Stellite" are a trade-mark.

J-METAL HAYNES STELLITE TRADE MARK

Red-hard, wear-resisting alloy of cobalt, chromium and tungsten

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

General Office and Works—Kokomo, Indiana
Foreign Sales Department—New York City

Haynes Stellite welding rods and information on other Haynes Stellite products also are available through the 46 apparatus shipping points of The Linde Air Products Company

CUTTER GRINDING

(Continued from page 17)

the best possible finish will be produced by the cutter.

The corners and periphery of the teeth should be ground just as carefully as the face of the teeth to assure the maximum number of finished units per grind.

Shell End Mills

One of the basic requirements for a high grade of milled finish with a shell end mill is a uniform height of the face of the teeth. If several such cutters are to be sharpened at one time, they may be circular ground on the face to meet this requirement. The cutters are then mounted on a stud supported in the work head of the cutter grinder, and the teeth are ground or "backed off" to a hair line behind the cutting edge and to the proper clearance angle for the material to be milled. Should the teeth be unevenly spaced, a condition sometimes developed during the hardening operation, the cutting lands will vary in width. It then becomes necessary to correct this condition by separately grinding the wide teeth to produce a uniform hair line width of cutting land.

Shell end mills sharpened in this manner will produce an exceptionally good finish, providing, of course, that the cutter runs true in the machine spindle. If this latter requirement is not fulfilled, all the good efforts of the cutter sharpening mechanic will be cancelled.

In milling aluminum, the standard shell end mill will produce better results if it is altered slightly. The face of alternate teeth should be ground .010" low, and the bevel on the corner should not exceed 1/32". Thus five of the ten teeth in a standard 2½" diameter shell end mill will do the majority of the work.

Taper Reamers

Grinding a taper reamer is one of the most meticulous operations performed on a cutter grinder. There can be no looseness or lost motion in any moving part of the machine, the tailstock centers must be in perfect alignment, and the centers of the reamer should be lapped round and true.

The conventional method is to grind

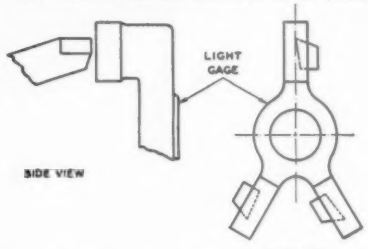


Figure 3. Suggestion for a light gage to test accuracy of sharpening.

all the teeth the same height. Reamers ground in this manner, while productive of good results, often require an excessive amount of power to ream the hole. For hand reamers this is very objectionable. The physical effort required for this operation may be materially lowered by sharpening the reamer in the following manner.

Grind all teeth the same height and to the correct taper, following the conventional procedure. Then mark one tooth, adjust the work .0002" towards the wheel, and grind the marked blade until the wheel sparks out. Index to the next tooth, adjust the work .0003" towards the wheel, and grind all the blades except the one marked. Adjust the work an additional .0005" towards the wheel, and indexing the reamer in the opposite direction, grind all the blades except the one marked.

The marked blade is now approximately .001" higher than the other blades. A reamer ground in this manner will cut more freely, require less power for reaming, and will produce a good finish.

Long End Mills

End mills which are too long to grind the face of the teeth in the conventional manner may be ground on the Cincinnati No. 2 Cutter Grinder with the set-up illustrated in Fig. 4. Up to 8" flute length may be accommodated in this manner. However, the range of cutter diameter is limited, because the overhanging table limits the traverse movement of the slide.

Angular Cutters

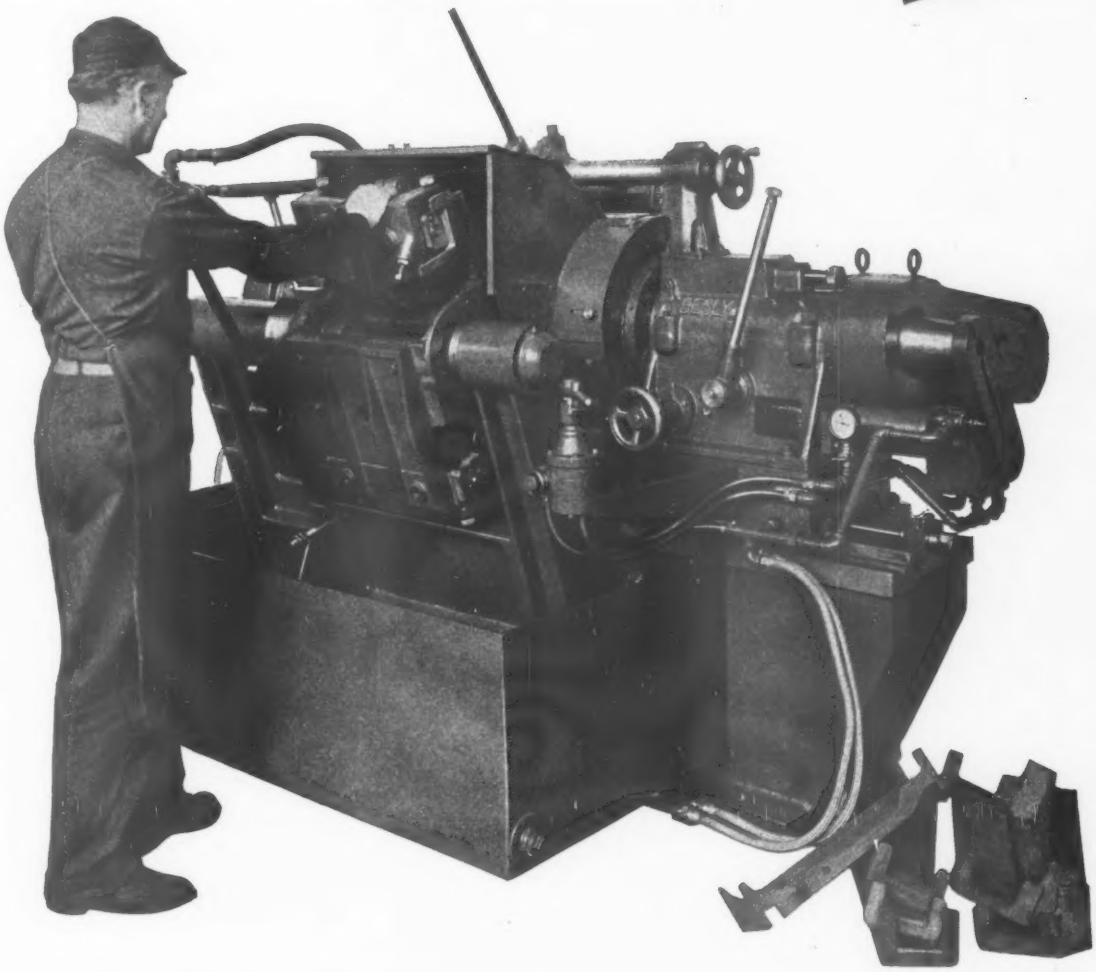
Like any other type of cutter, straight tooth angular cutters may be sharpened

(Continued on page 41)

ANOTHER TOUGH JOB licked by Besly Engineers

● Tractor Radiator Castings with up to ¼" stock to come off. Springy lugs that ordinarily mean lots of set-up time. Dense spots in the castings that are hard on tools. None of these obstacles bother when Besly grinding. ● Illustration shows #218-20" Wet Double Spindle Besly Grinder with Power Oscillated Two-Station Indexing Fixture—Hydraulic Feed on spindles—equipped with famous Besly Titan Steelbac Abrasive Discs grinding castings as shown at the rate of 60 per hour. Held to dimension plus or minus .002". Surfaces parallel with each other within .002". Compare this with results in your plant on similar jobs. ● Send prints, sketches or samples of your work. Find out what a modern Besly Grinder will do toward cutting your manufacturing costs. ● If you operate any type of grinder employing the side of a grinding wheel you should be using Besly Titan Steelbac Abrasive Discs—the Bolted-On Disc that is so widely used by leading manufacturers.

Write for your copy of Booklet on Besly Titan Steelbacs.



CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET ★ CHICAGO, ILLINOIS

New Literature

of Interest to the Tool Engineer

New information on filing and sawing speeds with contour machining is given in an illustrated folder recently prepared by the Continental Machine Specialties Company, 1305 Washington Avenue, So., Minneapolis, Minn., manufacturers of "Doall" equipment. Radii accomplished with each of seven widths of saw blades, filing output as measured in ounces of filings per hour, correct sawing and filing speed for more than 48 materials and other data on selection and use of the cutting tools employed by the contour machine, are given.

●

Boyar-Schultz Corporation, 2109 Walnut Street, Chicago, Illinois, have issued a new four-page pamphlet on their "New High Speed Profile Grinder." The bulletin is well illustrated and gives complete information relative to this machine for precision work and calls attention to several unusual features, such as the tilting table—with sine bar adjustments, portability, 20,000 R.P.M. speed spindle, visibility, etc. Specifications are also given.

●

Kingsbury Machine Tool Corporation, Keene, New Hampshire, have recently issued a new bulletin, No. 5-38, describing their new automatic positive feed drilling and tapping units. It contains many illustrations showing their horizontal and vertical units with splendid pictures of details of these units for setup and adjustment, tripping and synchronizing, feed change gears, speed change gears, multiple heads and sliding bushing brackets, etc.

●

Stanley Electric Tool Division, The Stanley Works, New Britain, Conn., have issued a new booklet—"Facts about Stanley Electric Screw Drivers." Practically all of the information that the title suggests is included in this handsome eight page bulletin punched for the standard three ring binder. It tells where and why Stanley Electric screw drivers are used in industrial plants, describes the different types of Stanley electric screw drivers and the accessories used with them.

●

A slide rule, designed to simplify the calculation of profit possibilities in equipment purchases, has just been developed by The Warner & Swasey Company, Cleveland manufacturer of turret lathes. Whether an investment in new equipment is justified—either for the shop or for the "front office"—generally depends on such factors as cost, increased production possible, number of hours used per year, machine cost per hour, and useful length of life. With this ingenious "slide rule" five scales thereon permit a rapid calculation of any one of the foregoing factors when the others are known or can be approximated, thus affording a speedy answer to the question of profit possibilities with investment in a new piece of equipment.

●

Cincinnati Milling and Cincinnati Grinders, Inc., Cincinnati, Ohio, have recently issued a publication entitled, "Cincinnati Vertical Hydro-Tel Milling Machine." This it is said, is the first comprehensive catalog which has been issued on these milling machines. Request it by No. M-796.

●

Severance Tool Manufacturing Company, 1522 E. Genesee Avenue, Saginaw, Mich., have recently issued their catalog No. 12 on "Midget Milling Cutters and Special Tools"—ground from the solid after hardening. The booklet is attractively illustrated and has a portion devoted to automobile body manufacturers and unusual applications of Severance tools to this specialized application. Other unusual uses for Severance tools are illustrated and described. Unusual applications of Severance tools in the Diesel Engine field are also described and illustrated. Mention "The Tool Engineer" when writing for your copy.

The Industrial Clutch Company, Waukesha, Wisconsin, have perfected a friction clutch for punch presses, and have issued a new bulletin describing for the first time the "Servo-action Punch Press Clutch." It is claimed that the Servo-action clutch has proved through a year of hard use that it is practical in every way, and offers all the hoped for advantages to punch press operation. It is said to be very reasonable in cost as well as low in maintenance cost.

●

Davis Boring Tools, St. Louis, Mo.—Bulletins Nos. 200, 300, 500 on fly cutters, special tools and boring tools. Free on request. Mention this publication.

Barber-Colman Type A's Hob Heavy Work Effectively

COMPLETE HOBBING SERVICE Helps Manufacturers Cut Costs

Shown below are Barber-Colman Type A Hobbing Machines on heavy work in a tractor plant. One workpiece is a shaft more than a yard long on which 3 sets of splines are hobbed the largest being 2.102″ to 2.103″ root diameter by 16¼″ long. Another job is a pinion shaft requiring over a foot of 16-spline hobbing. For accuracy, speed, finish, and economy Barber-Colman Ground Hobs are used on all four of the hobbing operations mentioned, and many others . . . all "plenty tough". Nearby are a couple of new Barber-Colman Type D's stepping up production on heavy hard gears. Elsewhere in the plant are other Barber-Colman Hobbing Machines and a Barber-Colman-equipped Hob Sharpening Department that keeps hobs in perfect condition for maximum service.

Barber-Colman Hobbing Service is complete from engineering to installation and onward; for hobbing tiny teeth in parts for watches and clocks to heavy gears, spline shafts and other parts for trucks, tractors and similar products. It is helping many manufacturers to cut costs while maintaining or improving quality. Perhaps it can save something for *you*. Investigate.

BARBER B-C COLMAN PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

CLEVELAND, OHIO
Barber-Colman Company
3030 Euclid Avenue

DETROIT, MICHIGAN
Hodges Machinery Company
101 East Baltimore Avenue

MILWAUKEE, WISCONSIN
Dumser & Schroeder
610 West Michigan St.

PROFILOMETER

(Continued from page 11)

speed of trace of about one inch per second is most suitable.

This Profilometer can be used on flat, cylindrical, or curved surfaces of wide variety and shape. The reading of the instrument is not affected by the curvature of the work piece. Adjustment for surfaces of different curvature is made by means of a small knob on the top of the tracer unit. This knob simply raises or lowers the tracer point to insure proper contact with the surface and does not affect the reading.

Another of the advantages in the use of the new Profilometer suitable for use in the shop is the fact that various styles of tracer units are available; for instance, the conventional style shown in Figure 1 will trace all flat surfaces and many of varying curvatures. For use in limited spaces, such as cylinder bores, etc., an extension "Flexarm" (Figure 2) has been designed. A special tracer for use on flat work which combines the tracer element and the microinch meter in a single unit is shown in Figure 3.

Profile Curves and Laboratory Modifications

Other modifications of the Profilometer have been developed for various other applications. For instance, it may be desirable to keep permanent records to show the size and shape of individual irregularities, and these often may be useful in determining the character of the surface as well as the magnitude of the roughness. In such cases, photographic records of the actual profile of a surface can be made on a laboratory Profilometer. Usually, such measurements can be made without damage to the piece. Generally, direct meter readings are more useful in the shop. Further, different types of irregularities are found in various types of machined surfaces; for example, long waves, "chatter" marks, feed marks, etc., as well as the usual "roughness" are often caused by a number of different factors and it is of great value to be able to measure them separately. By a proper selection of tracer support, tracer point size, speed of trace, electrical characteristics of the amplifier in the Profilometer and the period of the meter, it is possible to arrange a laboratory instrument to make almost any desired separation of the different irregularities with separate measurements on each. This, of course, provides the Tool Engineer with a positive method for determining the seriousness of each of the various factors which produce a particular irregularity which may be causing the greatest difficulty in producing a really fine finish.

For all ordinary applications where surface finish is to be measured in the shop the type P Profilometer offers the most practical and efficient means which has so far come to our attention. It has been used in actual production for nearly two years, and has supplied the answers to many important production problems of surface finish.

Figure 2. An example of the tracer unit developed for the measuring of odd shaped or "hard to get at" surfaces. The above photograph shows the tracer unit measuring the convex surface of a piston although it is equally adaptable to the measurement of the concave surface of a cylinder bore.

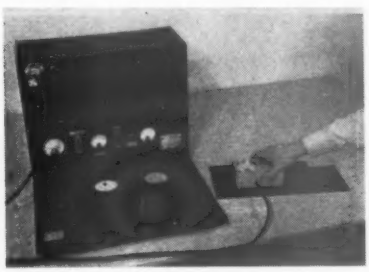
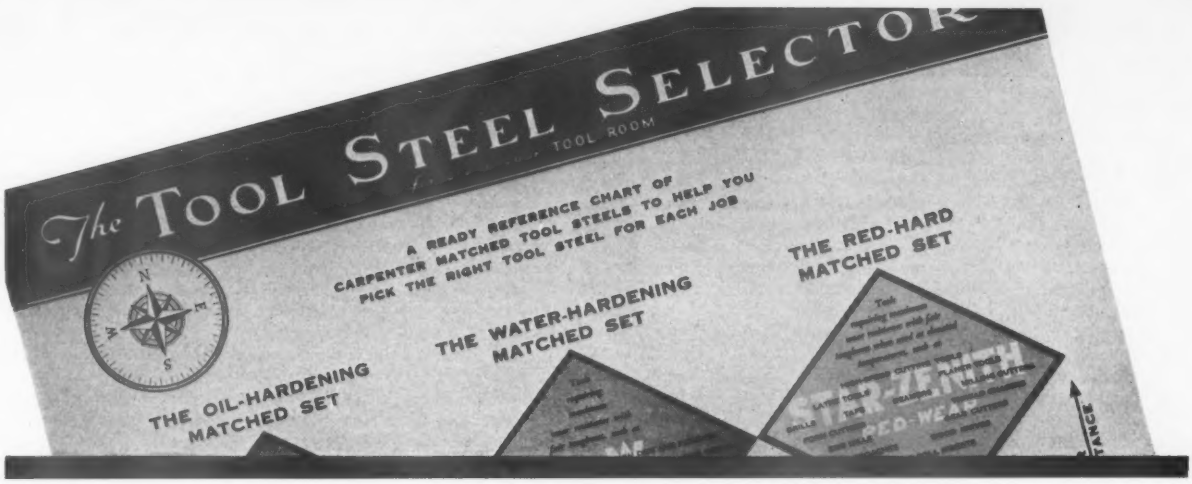


Figure 3. Profilometer for Routine Inspection on Production. A permanent installation for measuring flat surfaces. The indicator meter is mounted directly on the tracer unit for convenience.



How to decide **WHICH** *Tool Steel will do the job* **BEST!**

HERE is a problem that must be met continually in your tooling up recommendations. Your decision on the tool steel has a vital bearing on the success of those important recommendations.

Even the most careful calculations of tool costs, production speeds and delivery schedules can be upset by a tool steel that falls short of your expectations.

To overcome this, and help you provide an added safeguard for your recommendations, the Carpenter Steel Company has devised a systematic method for selecting the right kind of tool steel for each job. This method simplifies your work and insures more successful, economical tool and die performance.

You can readily apply this simplified method to your next job by sending now for your copy of the Carpenter Tool Steel Selector. This Selector, in the form of a big Wall Chart, serves as a guide and helps you to quickly decide *which* tool steel will do the job best. It places at your finger tips the type of knowledge formerly possessed only by the steel mill "expert."

Tool Engineers, who are enjoying the benefits and advantages of selecting tool steel this new way, report time savings — lower tool costs — bigger production per tool — and more dependable tool performances. It will cost you nothing for your copy of the big Wall Chart. Send the coupon below and get this helpful assistant now!

THE CARPENTER STEEL COMPANY, READING, PA.

MAKERS OF FINE TOOL STEELS SINCE 1889

The Standard Tool Steels of Industry

FREE!

TO TOOL STEEL USERS IN U. S. A.

THE CARPENTER STEEL CO.
122 W. BERN STREET
READING, PA.

Please send me free, and without obligation, a copy of your large Wall Chart Tool Steel Selector.

NAME _____ TITLE _____

FIRM _____ (Firm name must be given)

ADDRESS _____

Carpenter
MATCHED
TOOL STEELS

PRODUCTION PERSPECTIVES

(Continued from page 19)

ager of the Manufacturers' Association of Hartford County. The **Bristol** district **shows the largest total of reemployment, due to increasing orders at the New Departure plant of General Motors Corp. New Departure's Bristol plant now employs 1,500 compared with 900 in the late spring.** More workers have been taken back at the New Departure factory in Meriden. **Niles-Bement-Pond Co. reports an upturn in both orders and inquiries for machine tools and small tools. Bullard Co., Bridgeport,** earned net profit of $101,217 after taxes and reserves for the six months ended June 30, equivalent to 37 cents a share. **Small gains are reported in the materials handling** division of **Yale & Towne Mfg. Co.,** Stamford. **Bridgeport Brass Co.,** Bridgeport, **has announced completion of a $4,500,000 plant** in which all rolling mill operations will be located. The plant, using for the first time in the non-ferrous metals industry the straight-line production principle similar to that employed in steel manufacture, has a total floor area of more than 220,000 square feet and an estimated capacity of 6,000,000 pounds of metal a month. **Globe Slicing Machine Company** has **started construction of its new plant on Selleck street,** Stamford. **Gustav Albert Englund,** 69, vice-president and **factory manager of the Jacobs Mfg. Co.,** drill chucks, Hartford, **died September 16.** Before joining the Jacobs company 25 years ago he was master mechanic for the Pope Mfg Co., Hartford, which then manufactured automobiles and bicycles. **Vincent Weaver Allen, 49, assistant works manager of the Bridgeport Brass Co., Bridgeport, died August 25.** More than 30,000 people inspected the immense Bridgeport plant of General Electric Co. during an "Open House" September 1. The visitors watched operations in every department, heard explanations by guides and consumed tons of free refreshments. **Nielsen Tool & Die Co. has been organized at 278 Main street, Hartford,** with **Milton E. Nielsen** as **president** and treasurer.

President James Y. Scott of the Employers' Association of Western Massachusetts **said he believes there will be substantial orders in the machinery field the latter part of this year.** Several Springfield factories expect to pick up in number of hours in production and some have reported business entirely "satisfactory."

At the **Westinghouse** plant in East Springfield, **Works Manager L. E. Osborne was somewhat optimistic as to the outlook for the company's domestic refrigeration department. This division** of the plant, which was curtailed to three days a week, and more recently, has been operating on a four-day-schedule, is **now on a five-day schedule.**

Total employment in East Springfield plant of Westinghouse is about 2,050 with 1,700 of these workers in the shop departments.

Production and employment **at** the **United American Bosch** Corporation's plant in Brightwood has **started to improve and workers are being taken back.**

At the **Chapman Valve Manufacturing Company** in Indian Orchard operations are understood to have tapered off slightly in recent weeks. However, **new orders** are **said to be in prospect which will stimulate production considerably when released.**

Improvement in business conditions throughout the Greater Lowell district has resulted in a substantial increase in employment. Settlement of the protracted wage controversy at the Suffolk Knitting Company which already has resulted in the reemployment of many of the 900 workers with more to be taken back as needed, renewed activities at the Billerica Car Shops and increased orders in other industries have been factors in the change.

Industrial activity in Worcester is picking up. Foreign buying is helping the machine tool industry, although there has been a little better domestic demand. The wire industry is showing signs of returning activity that are heartening.

The machine tool industry is finding European markets best and orders have been coming to the plants from overseas. **Heald Machine Tool Co., Worcester, has orders on its books for grinding machines to go to England, France and the Scandinavian countries.** These orders, together with a slight pickup in industrial business, has permitted the company to call back some workmen who have been laid off. The **orders on hand assure two or three months work.** The domestic orders are coming from the automotive industry and allied lines. This source has not been so prolific as in previous years, due to the less drastic changes automobile manufacturers are planning for 1939 models. They

(Continued on page 46)

". . . . . always 'BORIN' IN', eh!"

"There's nothin' New! . . . . . It's just the old bunk!"

"Bunk nothin', pal—five years of developin' and perfectin'—an' I say they got somethin' there!"

"All right!—All right!—All right! . . . . . What's the dope?"

"You'll see—Right here in next month's TOOL ENGINEER"

Eclipse

ECLIPSE COUNTERBORE CO.
DETROIT, MICHIGAN.

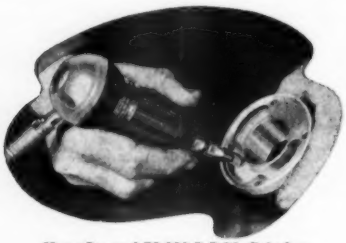
NEW *Equipment*

Johnson Ledaloyl Self-Lubricating Bearing Bronze

This new bearing material is now available for industry and has been developed in the laboratories of the Johnson Bronze Company, New Castle, Pa. It is said to involve an entirely new method of manufacture and imparts many new unusual and valuable bearing properties. Because of an exclusive process of "Pre-Alloying" permitting the introduction of lead, it is said this material eliminates harshness and provides conformability for mis-alignment. The combination of lead and graphite in the alloy plus an oil content makes "Ledaloyl" a most satisfactory self-lubricating bearing. It is said that this bearing material will not harm the shaft or housing, has sufficient strength for exceptional performance, supplies the right amount of lubrication at the right time. Information as well as a new booklet describing this new bearing material in detail is available without cost or obligation.

Onsrud 75,000 R.P.M. Grinder Has ⅛ H.P.

Onsrud Machine Works, Inc., 3909 Palmer St., Chicago, Illinois, has introduced the Onsrud Air Turbine Grinder "designed for continuous duty at 75,000 R.P.M.," with an actual rating of ⅛ H.P. with a weight of only twelve ounces. This new grinder, called the B-1, is designed for two purposes: (1) as a tool for exceptionally rapid and smooth tool and die

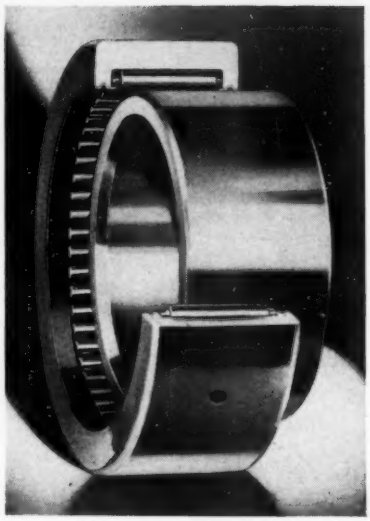


New Onsrud 75,000 R.P.M. Grinder

grinding and (2) as a marking tool for writing in all types of metals, plastics, glass, porcelain and other materials. Because of the exceptionally high spindle speed and power, it is claimed, the most difficult die operations are rapidly done, leaving a high type finish. It is said this grinder operates with equal efficiency in any position, and may be mounted into a lathe tool post holder for internal grinding or held in place in a vise for tool resharpening. It is also said this grinder cannot be heated by overloading, and operates continuously at less than room temperature. Further details may be had by writing the manufacturer.

New Type Heavy Duty Needle Roller Bearing—Announced by Bantam

Bantam Bearing Corp., South Bend, Indiana, has announced this new type of Heavy Duty Needle Roller Bearing to be known as "The Standard Quill Bearing" said to possess these outstanding features: The ordinary assembly of outer race with hardened retaining rings, washers, stampings, etc., has been supplemented by a one-piece, rigid, channel-shaped outer race in which a full complement of small diameter rollers is firmly held. A spring steel band is employed to maintain the rollers and outer race as a unit during assembly but is not called upon to carry any load while operating. The rigid rib surfaces of the outer race are accurately hardened and ground, thereby keeping rollers in perfect



alignment. Rollers are correctly proportioned to the pitch diameter involved and are made with husky curvilinear trunnions. The load capacity is high, it is said, and the space required is at a minimum. The design, it is claimed, is considerably simplified and all fragile parts have been eliminated. Assembly is said to be very easy and the bearings are available either with or without inner races. To render prompt service Bantam is carrying these Standard Quill Bearings in stock in a complete range of sizes for shafts from ¾" to 5".

According to Mr. A. H. Frauenthal, General Manager of Bantam, they have in the past years designed and made thousands of these unit type Quill Bearings for specific purposes but until recently had not developed a design sufficiently dependable to offer for general use. Users of bearings for heavy radial loads may obtain complete information on this new type needle bearing in the Bantam Bulletin No. 103S. Request your copy of this bulletin from the Bantam home office at South Bend, Indiana.

South Bend Improved Pedestal Adjustable Motor Drive Lathe

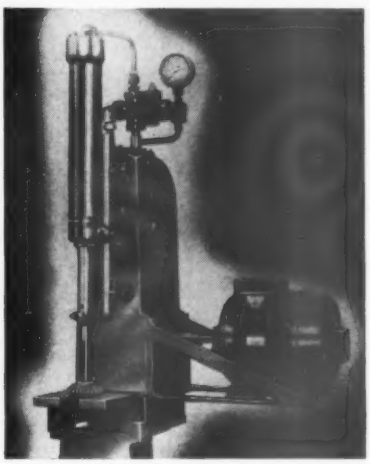
South Bend Lathe Works, South Bend, Indiana, announce an improved Pedestal type of Motor Drive, available in all sizes of South Bend Precision Lathes—9", 11", 13", 15" and 16" swing, and in bed lengths of 3' to 12'. A new double arm adjustable tension brace locks the Pedestal motor drive unit rigidly in

position when the lathe is in operation. Two turnbuckles, one on each arm, permit adjusting the cone pulley belt for any desired pulling power, and taking up belt stretch. Pulling a lever forward unlocks the tension brace, permitting the pedestal to tilt forward releasing the belt tension. This permits easy shifting of the cone pulley belt from one step of the pulley to another.

The lathe is relieved of all strain with the motor and driving mechanism mounted on the pedestal. Power is transmitted from the motor to the countershaft by V-belts, and from the countershaft to the lathe spindle by flat leather belt. This provides a smooth, steady pull, it is said, free from vibration and chatter. South Bend Lathe Works' new catalog No. 97 illustrates, describes, and prices the new Pedestal Motor Drive in all five sizes. Copies of this catalog may be had by addressing the company's Technical Service Dept. at South Bend, Indiana, mentioning "The Tool Engineer."

1½ Ton Bench Type Greenerd Hydraulic Arbor Press for Production

Greenerd Arbor Press Company, Nashua, New Hampshire, have announced their latest development — a completely self-contained, bench type hydraulic arbor press, suitable for pressing, broaching, assembling and burnishing operations. This press is cast in one unit, of special hydraulic semi-steel. The pump and control valve are mounted in the oil sump which is cast as part of main housing. Equipped with 2" piston and 3 piston rings. Ram is 1½" in diameter, packed



with chevron type packing.

The ram is put into action by hand lever and pressure will remain on work until lever is released, which will automatically return ram up to power stop which may be set at any predetermined point within the stroke of the ram. The working table is machined and is 8" by 8" with a 2" slot. The illustration shows this press broaching a keyway. Mention this publication when writing for information.

George Scherr Company Announces the "Metaphot"

The George Scherr Company, 128 Lafayette Street, New York City, announces the new Busch "Metaphot" — a metallurgical microscope of radically new design. This new instrument is said to be a combination of microscope and photographic camera assembled into one permanently aligned unit. Instead of bellows the camera is equipped with the new patented "Vario-Ocular," a device which changes the magnification of any eyepiece optically at the turn of a dial. Therefore, the ground glass remains always in the same fixed position right in front of the observer. The continuous series of magnification obtained thereby is highly desirable when definite magnifications are needed, for instance, exactly 100 diameters for grain size estimations or examinations of inclusions in

(Continued on page 40)

NEW EQUIPMENT

(Continued from page 38)

steel. Other standard magnifications of 200, 500, 1000, 2000 diameters can be easily obtained.

The Metaphot, it is said, meets the requirements of the shop and testing room, takes less space than a typewriter and is shock and dust proof. The instrument accommodates polished or fractured specimens of any size or shape and the lamp house may be tilted for inspection of such surfaces. It is claimed that the Metaphot should appeal to the practical production executive because it combines simplicity of operations with versatility in practical use.

U. S. Tool Company—Multi-Miller No. 5

U. S. Tool Company, Inc., Ampere, East Orange, N. J., announces the "Multi-Miller No. 5, with 6" table feed, 1 H.P. Motor for Spindle Drive" to meet the many requests for a milling machine with the versatility of the Multi-Miller but of greater capacity. Rotary milling, contour milling, climb milling, continuous milling and every other application of the MM-1 machine, made by this company, can be handled with the new model No. 5 and in addition the table feed has been increased from 4" to 6" and a machine designed for a 1 H.P. spindle drive motor in place of the ½ H.P. motor. Pliers, small arms, hardware and other fairly heavy parts can now be milled economically on the Multi-Miller, it is claimed. Mention "The Tool Engineer" when requesting further information from the company direct.

CHAPTER DOINGS

(Continued from page 21)

on this meeting as there will be a lot of us anxious to hear about it.

Hartford Chapter will inaugurate their fall season with a gala dinner-meeting featuring as speakers Prof. Caton and Dr. R. B. Ogilby, President of Trinity College. This promises to give a flying start to the new year of activities and a big success is anticipated for the occasion.

CUTTER GRINDING

(Continued from page 30)

by either the disc wheel or cup wheel methods. When using the cup wheel method, the clearance angles are obtained by rotating the cutter a given angle, bringing the cutting edge to be ground below the center of the wheel. Because of the taper of the cutter, the large end travels a greater distance away from the wheel when the cutter is rotated through the clearance angle. With the tooth rest mounted on the table or headstock, this method produces a variation in width of land. On the other hand, with the tooth rest mounted on the wheel head, the clear-

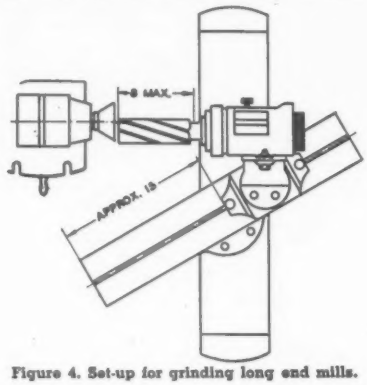


Figure 4. Set-up for grinding long end mills.

ance angle will vary. Therefore, this method of grinding straight tooth angular cutters should be avoided. The best practice is to use a disc wheel, because the clearance is then created by the curvature of the wheel, and mount the tooth rest on the wheel head.

Regardless of the type or price of the cutter, it should be sharpened by thoroughly experienced operators who have some knowledge of the material from which the cutter is made, and also a knowledge of the material which the cutter must cut. No one would consider assigning an expensive cutter costing several hundreds of dollars to an inexperienced cutter grinder operator, yet a small cutter, if not sharpened as carefully and accurately as the more expensive one, may cause a much more costly tie-up of the production line. The latest type of cutter sharpening machines, manned by experienced operators, are excellent investments for continuity of production.

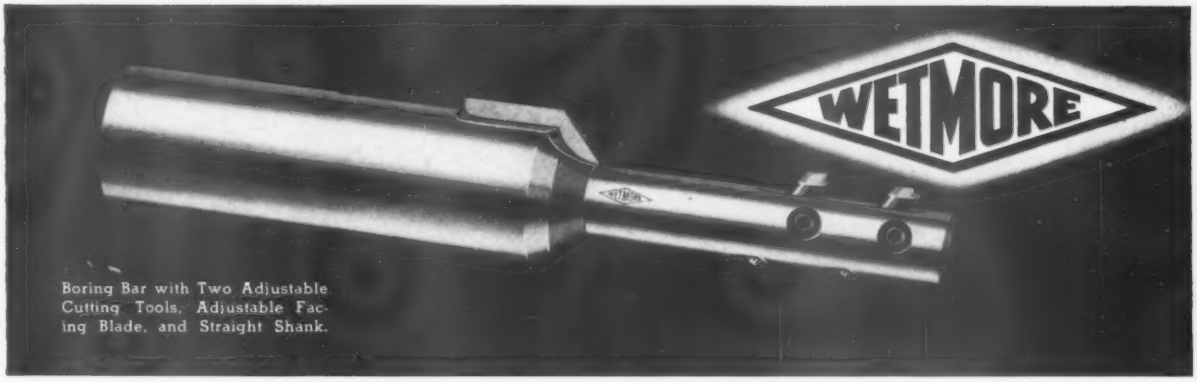
TORCH HARDENING GEARS

(Continued from page 28)

ing, will not eliminate faults in machining and mounting; and no hardening process so far discovered will make bad steel into good steel.

It can readily be seen that torch hardening is not limited to the hardening of gear teeth. It is already being used for hardening many other machine parts with success. It seems probable that in the future every well equipped hardening shop will have facilities for torch hardening. It is already being applied abroad successfully to automobile engine crankshafts, cams, and various other machine parts.

ANOTHER WETMORE BORING BAR
THAT CUTS TIME AND COSTS



Boring Bar with Two Adjustable Cutting Tools, Adjustable Facing Blade, and Straight Shank.

WETMORE FEATURES:

—eliminates present slow, costly, unreliable methods of adjustment.
—provides rapid, accurate adjustments in either direction with graduated screw.
—wedge lock positively and solidly locks tool without changing setting.
—rugged construction of bar and firm grip of cutting tools by wedge lock adds to cutting life by elimination of vibration.
—adjustment and wedge lock adaptable to all types of speed bars; boring units are adaptable to all types of boring and turning heads.
Send in your drawings—Wetmore Engineers will design tools to reduce tool-setting time and cost per piece machined.
See your Wetmore representative for many surprising possibilities and applications.

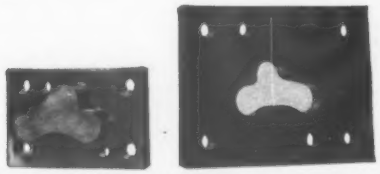
WETMORE REAMER COMPANY Dept. TL 420 N. 27th St. MILWAUKEE, WIS.

BOYAR-SCHULTZ PROFILE GRINDER No. 1

Saves time and does better work, fitting irregular shapes, profiles and difficult contours for dies, punches, templates, cams and for working to scribed lines.

Light in weight and easily portable. Grinding wheel is mounted in a reciprocating spindle which rotates at approximately 20,000 R.P.M. insuring an extra smooth finish.

Any shop doing work that demands fitting to the close limits necessary in modern tool and die practice will find that the BOYAR-SCHULTZ Profile Grinder No. 1 will soon pay for itself.



SEVEN HOURS SAVED ON THIS JOB

The time required to make and fit this Die and Punch Set, by the usual method of filing, hardening and stoning was estimated at 12 hours. The same Set, fitted and finished complete, using the BOYAR-SCHULTZ Profile Grinder resulted in a saving of 7 HOURS.

The die opening had a 6 inch periphery . . . was rough drilled and Do-All sawed without any filing or other hand work. After hardening, the die and punch were completely fitted with BOYAR-SCHULTZ Profile Grinder No. 1.

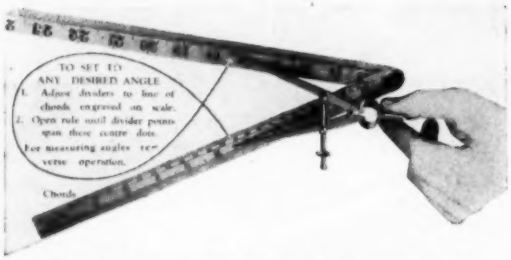
A Precision Machine Tool • • • A TIME SAVER for ALL Tool and Die Shops and ANY Shop Working To Close Limits

Write for descriptive Circular

BOYAR-SCHULTZ CORPORATION

2116 WALNUT STREET, CHICAGO, ILLINOIS

TWO TOOLS IN ONE



The Chesterman Stainless Steel Two Foot Rule Serves Also as a Protractor.

Every tool engineer, every mechanic and lay-out man, every practical man who works with a drawing board, can use the Chesterman Stainless Steel Rule. It is one of the most useful aids for measuring linear as well as angular dimensions.

Graduations are clear, accurate, and read in 1/8", 1/16" 1/32" and 1/64".

There is a scale of chords from 0° to 120° advancing by half degrees, on one side of the rule.

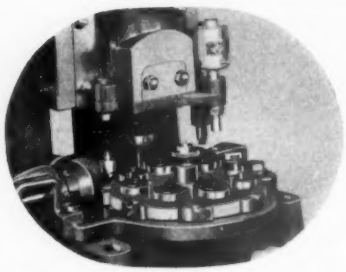
Two center dots are provided, one on each blade, by which, with the aid of a pair of dividers, the rule can be set to any desired angle. In the same way, any angle may be determined.

The Chesterman Stainless Steel Rule is ideal for everyday use. Order yours today. Price $2.25. Inquire for special quantity discount.

GEORGE SCHERR CO. 124 Lafayette St., New York, N. Y.

PUNCHES • SHEARS • SPACING TABLES

THOMAS AUTOMATIC DIAL FEEDS



5 sizes for any press

PRESSES • DIES • METAL-FORMING MACHINERY

BENDING AND STRAIGHTENING MACHINES • MULTIPLE DRILLS

THOMAS Automatic Dial Feeds are made in five sizes, suitable for mounting on any type of crankshaft-operated power press. Economical to install. (Illustration shows parts being blanked and grinding operation being performed simultaneously.)

Send us your inquiries on any type of automatic press feeding equipment. We can build feeds for any press or furnish complete presses.

THOMAS
MACHINE MANUFACTURING COMPANY

Name changed from Thomas Spacing Machine Co.
PITTSBURGH, PA.

FABRICATING MACHINERY

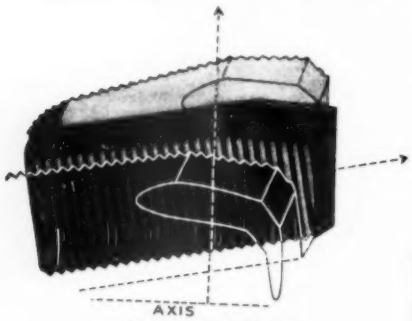
If you have a profit problem in your metal-cutting department . . .

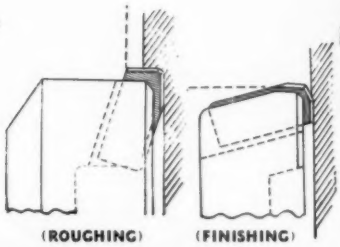
SEND FOR ILLUSTRATED CIRCULAR

ON THE IMPROVED O K DUAL ADJUSTABLE MILLING CUTTERS

THIS circular explains how, without pins, wedges or set screws, both radial and axial adjustments are obtained with these new cutters—affording much more usable blade than previously, facilitating regrinding, and speeding up production generally.

It shows, by clear drawings and text, just how serrated blades, tapered toward the bottom, fit into mating slots in the cutter body, where they are held in an immovable grip; and how the angle of the slots to the body makes possible this new dual adjustment.





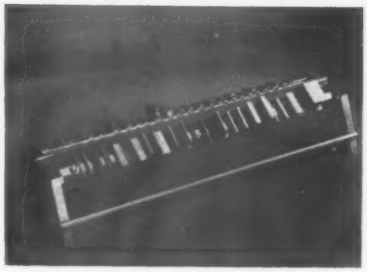
Manufactured Only By
THE O K TOOL CO.
SHELTON, CONN.

TRADE OK MARK

INSERTED-BLADE METAL CUTTING

TOOL SYSTEM

"PRECISION SHAPES"—AID TO MANY PRODUCTION PROBLEMS



A new machine now makes possible quantity production of shapes in brass, copper, bronze, aluminum, or in fact practically any metal which can be secured in the form of round, square, hectagonal or other shape bar metal block.

From the standpoint of the production man the availability of these forms in quantities is important because they enable him to produce in quantities types of objects which have heretofore been almost entirely hand-worked. Known as Precision Shapes these new forms are much smaller and more accurate than the sections which have been available by the extrusion process. The new machine literally begins where extrusion leaves off, and produces sizes so small as to be almost unbelievable yet with extremely precise dimensions. As a result, these shapes can be made with wall thicknesses as thin at $\frac{1}{64}$ inch, or even thinner if need be, while holding all operations to a maximum tolerance of .001 to .002 inch.

Through this new development, radio cabinets, automobile instrument panels, garnish moldings, escutcheon plates and many other objects not only improved structurally but also enhanced in beauty. For example, the growing use of plastics is a subject with which manufacturing executives should be familiar. The use of precision shapes to embellish plastics as well as to reinforce them is a highly interesting and important development.

It is interesting to note that this machinery, until recently was used mainly for scientific work. In the Julius Rosenwald Museum of Science and Industry in Chicago, there are 20,000 feet in use in various exhibits, made by the process. Many other scientific exhibits in America and Europe contain examples of the work done by this machine. At the present time, the rights for the machine, its products, and processing have been acquired by Precision Shapes, Incorporated, a new organization headed by Paul H. Fassnacht, which firm is now making these profiles available for commercial use.

Although the limits of accuracy are extremely close, the sections can be produced in large quantities at reasonable cost in an infinite range of shapes which are practically without restriction. Almost any conceivable shape, design, wall thickness or angle of slots can be made. For automotive instrument panels, metallic trim on radio sets, clock dial ornaments, in fact for an endless variety of purposes, these precision shapes may be anchored in plastic material or used independently as a permanent part of the structure. The shapes used in this manner greatly reduce any tendency to warp on the part of the plastic under unusual conditions. Also the fact that these shapes can be slotted in many different ways, enables them to hold material such as glass or metal.

Now that this process is available, a company in the metals field can undertake production orders for brass, bronze, copper, aluminum, etc., which heretofore it could not accept because of the impossibility of meeting the specifications with any previously known method of production. In the automotive field alone, there have been many designs, which have come from the boards of the engineer and designer which have defied the best efforts of production and tool experts as well as raw material sources. By the same token, other engineers have refrained from designs which these shapes now make capable of production because they knew that although the particular form they had in mind was ideal for the purpose, there was no known method of actually producing it. To problems of this nature Precision Shapes brings a method of solution.

The uses projected for these shapes are so varied that in a single day estimates, sketches and samples ranged from a device for testing dentures to dies for a macaroni maker.

LOW PRODUCTION PROBLEMS

(Continued from page 18)

the shearing machine at the front of the operator and a gage at the side; he then can perform both operations without additional handling of panels.

In conclusion it must be admitted that there are many short cuts employed by the jobber and low production shops, a few have been mentioned here and may evoke counter comment since there is an increasing demand for the low production product. It has been a privilege to show our problems and methods to readers.

Engineers from all parts of the United States will convene next year at the 1939 California World's Fair on Treasure Island, with July 13 set as Engineering Day at the Exposition.

Next Month

The November, 1938, issue of "The Tool Engineer" will be a real bang-up number. Another article on plastics—relative to design of molds—is scheduled. The doings of the Pittsburgh meeting will be recorded in detail for you Another article on surface finish. Real technical information the progressive Tool Engineer can use.

PRODUCTION PERSPECTIVES

(Continued from page 36)

have not had to retool their plants as extensively as in previous years.

Norton Co., Worcester, is benefiting from the same sources. There is a pick-up in the automotive orders and recently the company **secured an Amtorg order for machinery to go to Russia.**

Frederick W. McIntyre, vice president of the Reed-Prentice Corp., Worcester, who recently returned from a six weeks' business trip to Great Britain, **said that the American machine tool industry can continue to get a share not only of the European but also of the English market.** United States machine tool makers have a decided "edge" with their specialty machines, he said.

Frederick R. Allen, general manager of the M. J. Whitall Associates, Ltd., Worcester, **announced that the plant, which has been closed for six weeks, has started partial production.**

Herbert M. Darling, who has been superintendent of the Wells Tool Company of Greenfield for several years, has left for Rochester, N.Y., where he becomes superintendent of the small tool division of the Consolidated Machine Tool Corporation.

Employment increase in 19 Pittsfield industries for two successive months is reported by the Pittsfield Chamber of Commerce.

HIGH PRODUCTION
with
BRADFORD MACHINES

Operations—

Station 1—Load and unload.

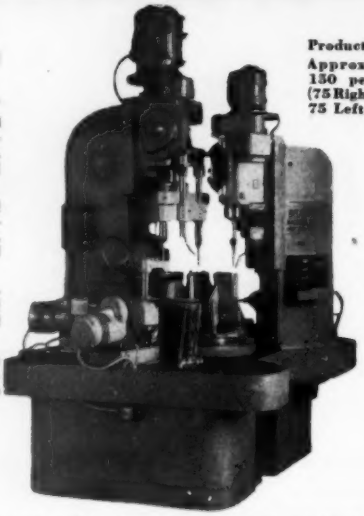
Station 2—Idle.

Station 3—Drill 21/32 hole one-third through, and drill 13/32 hole halfway.

Station 4—Drill 21/32 hole two-thirds through, and finish drill 13/32 hole.

Station 5—Finish drill 21/32 hole, and drill 5/16 tap hole.

Station 6—Ream 21/32 hole to .375 and tap 5/16-24 hole.



Production—

Approximately 150 per hour (75 Right Hand. 75 Left Hand.)

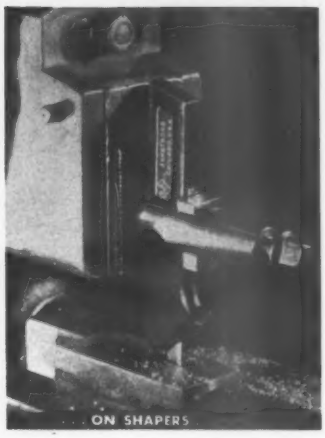
A Bradford six unit machine for drilling, reaming and tapping automobile steering knuckle arms. A six station indexing fixture is used holding 12 pieces, 6 right hand and 6 left hand. Control of the machine is fully electric by means of push buttons, limit switches, solenoids and magnetic contractors, all of the electric equipment and wiring being built into and an integral part of the machine.

Write for descriptive literature.

The Bradford Machine Tool Co.

CINCINNATI (Established 1840) OHIO

ARMSTRONG



ARMSTRONG *Has Solved that Tool Problem*

If you are having a tool problem on any of your lathes, planers, slotters or shapers, you will find the best solution in the Armstrong System of tool holders. Comprising over 100 sizes and shapes the Armstrong System of tool holders provides tool holders for every operation on lathes, planers, slotters and shapers. Each ARMSTRONG TOOL HOLDER is a permanent, multi-purpose tool that reduces tooling-up to the selection of a cutter and tightening of a set screw. Each effectively equals a complete set of forged tools, still is more efficient than any forged tool. Each "Saves: All Forging, 70% Grinding and 90% High Speed Steel," and cuts cutting costs to an absolute minimum. Each is stronger beyond any need, will permit, with safety, speed, and feeds limited only by the capacity of the machine tool on which it is used.

You will find in the Armstrong System, new "spring" tool holders for the tough alloy steels, absolutely rigid tool holders for the new carbide tipped cutters, 2 Types of Threading Tools, 5 Types of Boring Tools, Side Tools, Knurling Tools, etc., etc. . . . each the complete answer to some new metal cutting problem. Write for the B-37 Catalog. It is the "handbook" of better metal cutting methods.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

360 N. FRANCISCO AVE., CHICAGO, U.S.A.

Eastern Warehouse and Sales:

199 Lafayette St., New York, N. Y.

San Francisco London

Insuring TAP LIFE

This tap will wear well

This tap will soon wear undersize

This comparator, one of the many which control the manufacture of every "GREENFIELD" tap, throws into relief the actual life expectancy of the tap.

Taps which look alike may vary tremendously in performance. Rigid inspection is one of the factors which makes "GREENFIELD" taps noted for consistent better than average production.

GREENFIELD TAP & DIE CORPORATION Greenfield, Mass.
Detroit Plant: 2101 West Fort Street

Warehouses in New York, Chicago, Los Angeles and San Francisco

GREENFIELD

USE LAYOUT FLUID

for general machine shop and tool room use on dies, jigs, fixtures, and machined parts. With the use of the die blue layout fluid, you do not have to polish the surface of work. Simply wipe surface fairly clean and brush on.

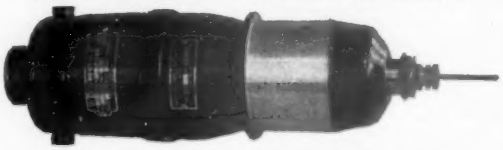
DRIES INSTANTLY

5 oz. 40c; 1 qt. 90c; 1 gal. $2.50

Dayton Rogers Manufacturing Co.
Minneapolis, Minn.

GOVRO-NELSON

AUTOMATIC DRILLING UNIT



FAST—COMPACT—CENTRIFUGAL FEED PROTECTS DRILLS—EASILY ATTACHED

Four models—1800 and 3600 synchronous and 5500—12000 R.P.M. Universal Motors.

HOLE ENGINEERING SERVICE

307 Stormfeltz Loveley Bldg., Detroit, Mich.

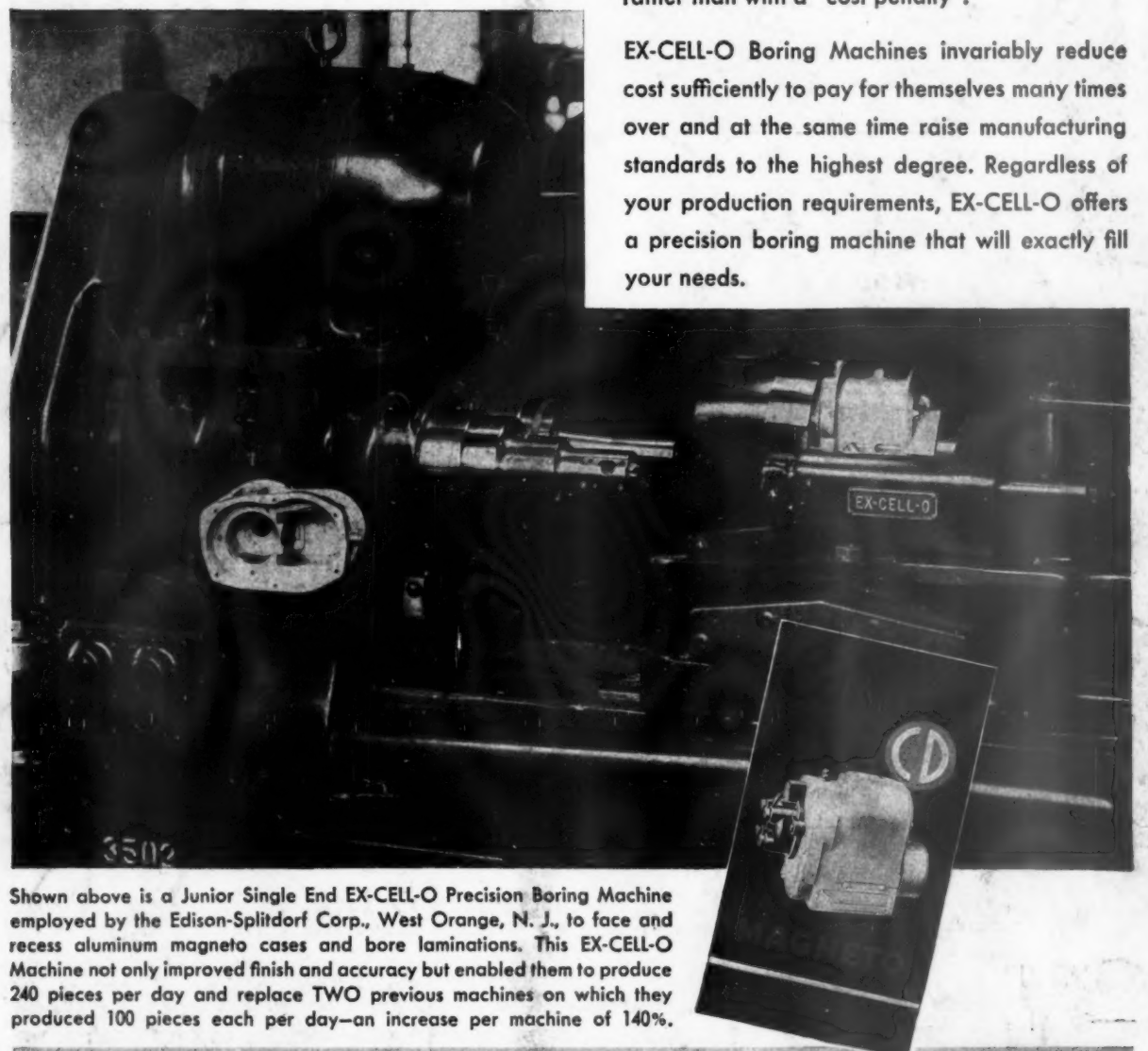
Advertisers' Index

IMPROVES ACCURACY & FINISH

. . . and pays for itself!

DAY in and day out EX-CELL-O Precision Boring Machines are proving that extreme accuracy and high finish need not be expensive—that they can, in fact, be had at a saving rather than with a "cost penalty".

EX-CELL-O Boring Machines invariably reduce cost sufficiently to pay for themselves many times over and at the same time raise manufacturing standards to the highest degree. Regardless of your production requirements, EX-CELL-O offers a precision boring machine that will exactly fill your needs.



Shown above is a Junior Single End EX-CELL-O Precision Boring Machine employed by the Edison-Splitdorf Corp., West Orange, N. J., to face and recess aluminum magneto cases and bore laminations. This EX-CELL-O Machine not only improved finish and accuracy but enabled them to produce 240 pieces per day and replace TWO previous machines on which they produced 100 pieces each per day—an increase per machine of 140%.

EX-CELL-O

REG. U.S. PAT. OFF.

DRILL JIG BUSHINGS, GRINDING SPINDLES, HYDRAULIC POWER UNITS, PRECISION BORING, TURNING AND FACING MACHINES, PRECISION THREAD GRINDERS, COUNTERBORES, BROACHES, CARBIDE TOOL GRINDERS, CARBOLOY TIPPED TOOLS, SPECIAL HIGH PRODUCTION MACHINES, GROUND FORM TOOLS, PRECISION PARTS, MILLING CUTTERS